SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXII.—No. 25. ESTABLISHED 1845. NEW YORK, JUNE 22, 1895. [$3.00 A YEAR. WEEKLY.

HUNTING THE TIGER BY NIGHT.

Although India traces its civilization back to the earliest time, and may be looked upon as the cradle of nations, to the European it represents the paradise of travelers, and is the abiding place of the transient.

The ambition of many of those who visit India for pleasure is to taste the excitement of the chase after the wild game of the jungle. Traveling princes and those who are favored by an invitation from some sporting maharajah are generally favored with a hunt from the back of an elephant. Beaters are sent into the wilderness in advance of the hunting party, and the game is gradually driven toward the spot where the party has been stationed. Elephants, specially trained for the purpose, are employed, and they are generally selected for their courage and sagacity. Other methods of hunting, however, which require less formidable preparations, are more generally resorted to. One of the most common methods of shooting is that by night, when a blue light is opportunely burned to give the sportsman an opportunity to take aim at a tiger which has been attracted to the spot by some form of bait, the sportsman being located above in a machan or some other point of vantage. In our illustration, however, a correspondent in Calcutta has employed a different and more advanced method of securing his prey, having resorted to the use of electricity to reach the desired result. He describes what he has accomplished as follows:

"I do a good deal of shooting off and on in the Sunderbunds and other parts of India, principally tiger. As the jungles are very thick, the only way is to sit up at night in a machan or platform over a cow or over an animal he has killed. At present I use a battery of six large cells, filled with sal ammoniac. It is very heavy and cumbersome and the light only a five candle power lamp. Its recommendations are that the battery is good for the next ten years and only wants an occasional filling up of the cells with water and sometimes a little fresh sal ammoniac. As I can only go shooting during six months of the year, this is a great advantage. The method of using is as follows: From the box containing the cells I have a line of wire (double of course), say 30 to 40 feet long, slipped onto each end of the box by butterfly nuts, the lamp, which is tied to a branch of a tree immediately over, say 20 feet high, the bait being at the other end.

"At about two yards from the battery there is a connection, I think called a male switch. A short line of wire about 3 or 4 feet long makes the connection to the fore-end of my rifle; at one end of this short length is a female switch to fit onto the above male one, and at the other end two small rings are made of the wires. These rings are fastened by two big-headed screws to the bed of the connection. On nearing the tiger at the kill, I aim as nearly in the direction as I can, then a slight pressure of the thumb makes the electric connection, and the light opens right over the tiger. As the tiger is not in the habit of looking up, it is a second or two before he can make out where the sudden light has come from, and by that time he has a shell well into his ribs, and further proceedings interest him no more."

The difficulty with the system, however, was the great weight and size of the battery used, and the light was too feeble. Our sportsman also employed accumulators, but they did not seem to be adapted to such rough work. He is now fitting himself out with the Capo-farad battery, which may be carried in the belt like cartridges. It is estimated that thirty of these batteries carried in this way would be sufficient to provide a sixteen candle power light, which would burn a sufficiently long time for the purposes of shooting. It would seem as if such a system might also be adapted for big game shooting in the Rockies, where night hunting for the wily grizzly is also resorted to on much the same plan as that employed in the far East.

HUNTING THE TIGER BY NIGHT WITH ELECTRIC LIGHT

A Shower of Black Ants.

The warm, thunderous state of the atmosphere, Wednesday evening, presaged a heavy downpour of rain in the city and vicinity, but this expectation was not realized, and the rain passed off with a slight shower. Instead of the rain a shower of another kind resulted, which is one of the most curious visitations in the history of the city. On the sidewalks, in the roads, upon the roofs, and the insides of the houses there was seen, yesterday, numbers of large black ants crawling about. They were found as plentiful in the outskirts of the city as on the main streets, and from the fact that some of these insects have wings while others have dropped or shed them, it is natural to conclude that they have migrated from some district to the south of the province, and have come to stay. They are large, black-bodied specimens, about the size of a wasp, and have the strong nippers of their race. They are not native of Manitoba, and are similar to the African ant.—Winnipeg Free Press.

Improved Lighthouse Apparatus.

The Sule Skerry lighthouse tower has been in progress during the past three seasons, and is now approaching completion. The tower is erected on a rock which rises in the Atlantic to a height of about 40 feet, situate about 40 miles in a westerly direction from Stromness and nearly the same distance from Cape Wrath, but in a northwesterly direction. The rock is exposed to the force of the Atlantic and Polar waves, and has been, no doubt, the scene of many shipwrecks which are unrecorded in the Board of Trade's annual "Wreck Register," as no wreck receiver was there to note them. The lantern which is to contain the optical apparatus was erected by Messrs. Steven & Struthers last year. It is of the largest diameter (16 feet) hitherto erected on any lighthouse tower, and is 12 feet 2 inches in height of daylight. The optical apparatus is known by the name given to it by the original designers, Messrs. Stevenson, as hyper-radiant, and is acknowledged by all lighthouse engineers as the most notable improvement of recent times, as it utilizes and condenses all the rays of light emitted by burners of larger diameter than could be used with advantage in Fresnel's first order lights. Original of suggested in 1869. It has been still further improved by the spherical form of lens and equiangular prisms. The Sule Skerry apparatus has three faces, each face consisting of three lenses with prisms above and below them so designed as to give a group of three flashes of light of equal intensity in quick succession every half minute, the whole forming a cage of polished glass, set in gun metal frames, 9 feet in diameter and 8½ feet in height. In the focus there is placed a burner having six concentric wicks. This apparatus was made in accordance with Messrs. Stevenson's design by Messrs. Barbier & Bernard, Paris. The glasswork is made to revolve at the required speed by a machine, driven by weight, made by Messrs. Steven & Struthers. The apparatus revolves on a carriage working on conical rollers, and makes one revolution in a minute and a half. It is expected that the light will be shown to the mariner for the first time during next autumn. It will be elevated about 112 feet above the sea, and will, therefore, have a range of 16½ nautical miles.

Blowpipe Glass Mix.

A recipe recommended by the Pottery Gazette for glass to work before the blowpipe, such as glass for making delicate chemical apparatus and small fancy blown ware, is as follows:

Sand	100
Salt cake	70
Lime	20
Coal	5

Weber recommends having a small quantity of alumina also. The Thuringian factories, which make considerable glass of this kind, use sand containing 4 per cent alumina as impurity.

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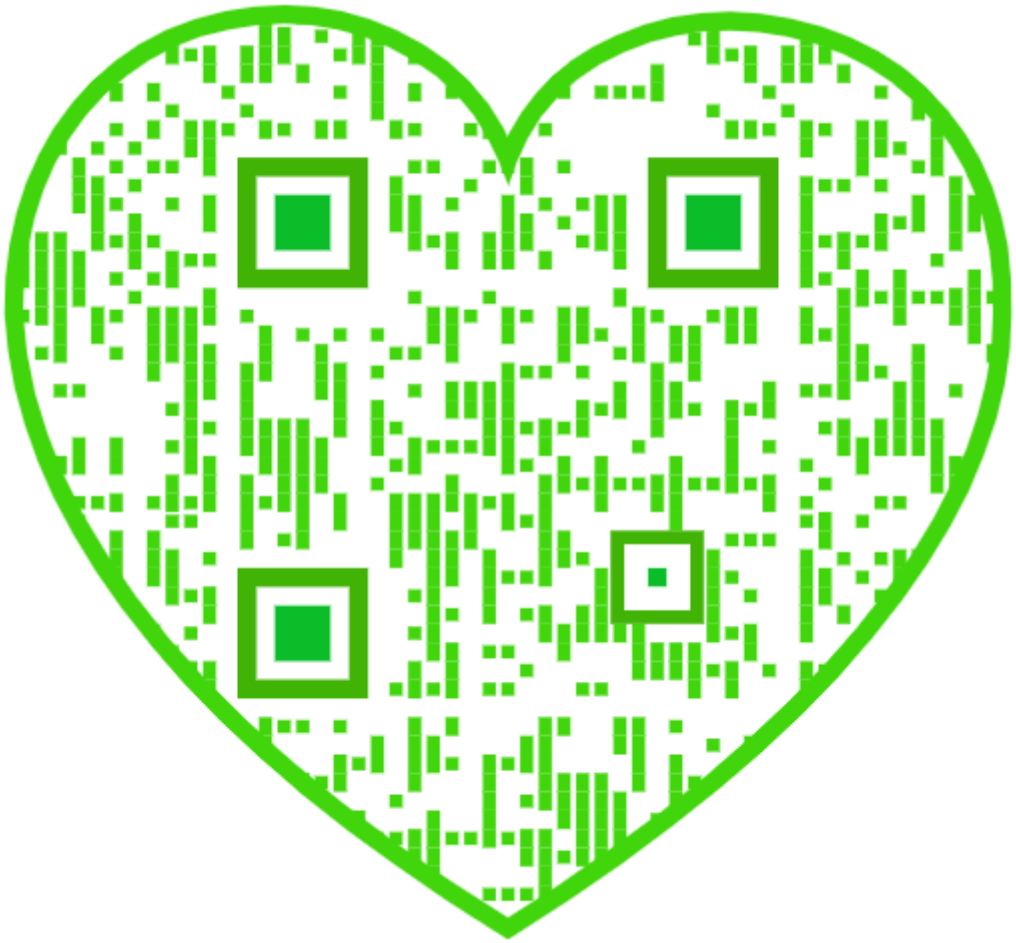

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
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MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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NEW YORK, SATURDAY, JUNE 22, 1895.

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FIRST VOYAGE OF THE ST. LOUIS.

The American Line steamer St. Louis completed her maiden voyage at 4:45 A. M., Thursday, June 13. The actual time from Sandy Hook to the Needles, a cluster of three pointed rocks in the English Channel, west of the Isle of Wight, was 7 days, 3 hours and 53 minutes. The vessel was delayed five hours by fog. The engines are capable of making 95 revolutions a minute, and for a time, on the trial trip, their speed was increased to 98 revolutions, but on the voyage the engines made only 76 to 84 revolutions per minute. One peculiarity about the new engines is the smoothness with which they run, as, according to the reports of the passengers, at no time or in any part of the ship was the vibration sufficient to enable any one to count the revolutions of either of the screws. During the first few days some difficulty was experienced with the ventilating apparatus, but this was overcome. The daily runs of the St. Louis were 314, 443, 431, 441, 433, 432, 416, and 249 knots, the average speed being 18·38 knots. For a first voyage, this is considered highly satisfactory. The arrival of the St. Louis at Southampton gave occasion for public rejoicing. The event is to be further celebrated by special festivities.

THE CHUPADEROS METEORITE.

The great Chupaderos meteorite, which was discovered broken in two immense pieces in 1581, may now be seen at the portal of the National School of Mines, in the city of Mexico. One piece has been placed at each side of the courtyard entrance. The huge, irregular masses have the appearance of brown hematite iron ore, but at points where they have been chipped or filed the common meteoric striations are plainly recognizable. The smaller piece is 7 feet long, 3 feet 7 inches wide, and 1 foot 8 inches thick, and weighs 20,450 pounds. The larger is 8 feet 2 inches long, 6 feet 7 inches wide, and 1 foot 4 inches thick, and weighs no less than 34,400 pounds. The dimensions given are, of course, averages, as the specimens are exceedingly uneven and are full of trilobite depressions or "pot holes."

The form of the two pieces leaves no room for doubt that they were originally parts of one great meteorite weighing more than 27 tons. The density has been calculated at 7·8.

The two sections were found 800 feet apart, at a point 900 miles from the city of Mexico. More than four centuries later, in 1893, they were carried to that city and placed in their present position.

THE SCIENTIFIC AMERICAN AS AN ADVERTISING MEDIUM.

Referring to our advertising columns, we call attention to the announcement of Mr. Layman, inventor of the Outing Boat, and to a cablegram order for boats therein presented, from the Grand Duke Alexander of Russia. His Highness, it appears, is a reader of the SCIENTIFIC AMERICAN; hence his order to the American boat maker.

There is no doubt the SCIENTIFIC AMERICAN is the most carefully read and most widely distributed paper of its class in the world. It reaches every nook and corner of the globe. The array of manufacturing industries, of which announcements are presented in every number, proves how very valuable the paper is as an advertising medium. Mr. Layman states that the SCIENTIFIC AMERICAN brought him over two thousand correspondents, and he adds the paper "has been a wonderful help to me in building up my business." We have no doubt hundreds of other advertisers could testify to similar benefits received.

FORCE EXERTED BY THE HUMAN JAWS.

Dr. G. V. Black, a dentist of Jacksonville, Florida, has made some interesting experiments upon the force exerted by the human jaws in the ordinary mastication of food, and also the greatest force which the jaws are capable of exerting.

By means of a spring instrument provided with a registering device he took records of about 150 "bites" of different persons. Of these, fifty have been preserved as characteristic of the ordinary man, woman and child. The smallest pressure recorded was 30 pounds, by a little girl seven years old. This was with the incisors. Using her molars, the same child exerted a force of 65 pounds. The highest record was made by a physician of thirty-five. The instrument used only registered 270 pounds, and he simply closed it together without apparent effort. There was no method of determining how far above 270 pounds he could have gone. This test was made with the molars. Several persons exceeded a force of 100 pounds with the incisors and 200 with the molars. The physical condition of the persons experimented upon seemed to have little bearing upon the result. Dr. Black is of the opinion that the condition of the peridental membranes is the controlling factor, rather than muscular strength.

Dr. Black found that, in the habitual chewing of food, much more force is exerted than is necessary. In chewing a piece of beef steak, the crushing point of which was from 40 to 45 pounds, from 60 to 80 pounds stress was actually employed at each thrust of the teeth. The principal articles of food tested had crushing points as follows: Steak, 40 to 45 pounds; mutton chops, 35 to 40 pounds; broiled ham, 45 to 60 pounds; roast beef, 45 to 60 pounds; pork chops, 20 to 25 pounds, and the choicest parts of cold boiled beef tongue, 3 to 5 pounds. The tougher parts of beef and mutton required a crushing force of 90 pounds in some instances.

IRON WORKING AMONG PRIMITIVE PEOPLES.

Dr. Ludwig Beck, of Germany, in his recent work on the history of iron, gives some interesting information in regard to the furnaces, tools, and implements used by the savage races of Africa and Asia. The iron ore used by the African smith is usually hematite, which is found in great abundance. His furnace is of clay with four draught openings at the bottom through which air pipes are inserted. The furnace is about four feet high and will produce a lump of excellent iron in forty hours.

The Bango and Bataka tribes handle the white hot metal with tongs made of green wood held together by an iron ring. Their anvil is a square stone with a top as flat as possible, and another stone does service as a hammer. With the Kaffirs the process is even less complicated than this. The iron is not formed in a lump, but the drops of molten metal are allowed to cool, and are afterward picked out of the slag separately. The larger ones are hammered out flat between two stones, and a little heap is built up with the flat pieces outside and the small pellets packed between them. This is then given a welding heat and forged.

The Zulus make excellent assegais, beautifully polished with bark and ground to the keenest of edges upon a coarse stone. The African smiths have no vises, but hold the implements they are making between their feet, leaving both hands free to use such tools as they possess.

The natives of Borneo and Sumatra have brought the art of iron and steel making to a high degree of perfection. The furnace commonly used in Borneo is of yellow clay, strengthened with rings of bamboo. It is about 3 feet high and 10 feet in outside diameter. The walls are 2 feet thick. The blast apparatus consists of an upright wooden cylinder open at the top and closed at the bottom, where a valve connects it with bamboo pipes leading to the furnace.

The cylinder is fitted with a plunger, which is moved downward by hand and upward by a spring pole to which it is fastened.

The iron ore is roasted about twelve hours in a wood fire and then broken into small pieces and mixed with ten times its volume of charcoal for smelting. When a lump of iron is finally produced it is taken out of the furnace with wooden tongs and hammered with wooden mallets. It is then cut into small pieces and hammered again until the slag is driven out, and a very good grade of soft steel remains. The waste is said to be one-third.

THE COMMERCIAL VALUE OF MONAZITE.

It begins to look as though the great value of monazite mining lands had been very much overestimated. There is, of course, a demand for rare earth oxides for the manufacture of incandescent gas lamps, etc., but the supply of monazite is, unfortunately for the speculator, practically unlimited, and its price has dropped correspondingly.

Monazite (from *μοναζειν*, to be solitary) was so called in allusion to its supposed rarity. For a long time subsequent to its discovery in Norway it was believed to exist nowhere else. It was afterward found, however, in Silesia, Bohemia, Belgium, England, Brazil and the United States. The deposits in this country are near Norwich, Conn., and in North Carolina. Monazite is in substance a phosphate of cerium, lanthanum and didymium, containing silicon and thorium in variable proportions, probably as impurities. The oxides of the rare earth metals, cerium, thorium, yttrium, erbium, lanthanum and zirconium possess the peculiar property of becoming incandescent at a moderate heat. The light emitted is the greatest in the case of thorium, and this oxide of this metal is obtained principally from monazite. It is used extensively in the Welsbach lamp, where a network mantle of the oxide is suspended over a Bunsen burner and produces an intense white light.

When monazite was discovered in North Carolina, great excitement prevailed for a time. Fabulous stories of the value of the resinous-looking substance were circulated and sand from the river bottoms was carefully washed over in cradles like those used by the gold prospectors of California. Some of the pioneers made a good deal of money at first, but, as the washing process is exceedingly laborious and slow when conducted by hand, and many tons of sand must be washed to extract one of monazite, nobody got rich. Nevertheless the people all believed firmly that immense fortunes could be made with proper apparatus for mining, and chemists and engineers in the Northern cities were overwhelmed with letters and circulars

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in which monazite lands were offered as great bargains at absurdly high prices.

Meanwhile the representatives of the consumers had quietly placed contracts at the lowest possible figure and the price of the mineral began to drop. As last winter was a severe one and the ice in the rivers interfered with the washing, good, clean monazite sand sold for fifteen cents a pound. Now it can be had for five or six cents, and there is not a great demand at that. It is doubtful whether the entire output of North Carolina since the discovery of the mineral has brought $125,000.

SOME FACTS ABOUT GLASS.

The most scientific glass workers of to-day are no more proficient in their art than were the craftsmen of ancient Thebes 4,000 years ago. These remarkable artisans, many of whom were priests high in authority, were well acquainted with glass staining, and displayed the highest artistic skill in their tints and designs. The colors were perfectly incorporated with the structure of the vitrified substance and were equally clear on both sides. The priests of Ptah, at Memphis, had a factory for the manufacture of ordinary glass, and also devoted their attention to imitating precious stones, succeeding so well that specimens now found require an expert to distinguish them from the real gems. They were also acquainted with the use of the diamond for cutting glass. A specimen of beautifully stained glass, now in the British Museum, has the cognizance of Thothmes III engraved upon it.

Spun glass was first brought into practical use about fifty years ago by Jules de Brunfaut, a French chemist, although the art of spinning glass was practiced long before that time. He made a thorough study of the subject in Vienna. He first succeeded in softening the hard, shiny effect of the glass fabric, giving it a silky effect that was much more pleasing. Next he endeavored to reduce its brittleness by making a spun glass, whose threads were much finer than those of silk, and whose texture was much like that of wool. This glass could readily be woven and all kinds of articles were made of it. Among other things it was found especially suitable for surgical use, owing to its antiseptic properties and its cleanliness. The fact that glass is unattacked by most acids made the fabric useful for laboratory filters, and nearly all well equipped establishments of the kind now use them. The cloth is, besides, non-combustible and a poor conductor of heat. As the individual fibers are perfectly non-absorbent, grease spots and stains can be readily removed. For this same reason the cloth cannot be dyed, but it can be spun of colored glass and the color is absolutely fast and unchanging.

Up to the beginning of the sixteenth century the glass used in stained glass work was what is known as "pot metal," that is, it was colored in mass through its entire substance. Painting was only used to bring out the shading and fine line work, and the paint was always brown, which was afterward "fired" into glass. During the sixteenth century a rich yellow stain, obtained by the use of silver salts, came into use. It was also used upon blue glass to produce green effects. Shortly afterward the irregular depths of tint in the glass were first utilized to give modeling. The ruby glass used at this time was made by placing a thin layer of ruby "pot metal" upon the surface of a sheet of white glass and welding the two together by heat, as the ruby alone became opaque as soon as any thickness was reached. It soon occurred to some one to cut or grind away the ruby surface to produce white figures on the red ground. By staining the exposed portions, they were also able to get rich yellow and red contrasts. This led to extending the practice to other colored "pot metals," until a great variety of beautiful effects were produced.

When glass contains little or no lime it shows a marked tendency to become opaque upon cooling, probably owing to minute crystallization throughout its structure. The so-called alabaster glass is made by reheating glass of this kind and allowing it to cool slowly. Opalescent glass is that which possesses the same tendency in less degree. A good "mix," as it is called by glass workers, for alabaster glass is 100 parts of quartz sand, 45 parts of potash, 3 parts of calcined borax and 5 parts of silicate of magnesia.

CHICAGO DRAINAGE CANAL—ITS EFFECTS ON THE COMMERCE OF THE LAKES.

The Chicago drainage canal is an undertaking that bids fair to create a stir in at least half a dozen large divisions of the world's activity, whether it is ever opened or not. Both science and mere economics are viewing the engineering operations between the Chicago and the Desplaines Rivers, which undertake to neutralize the watershed between the Great Lakes and the Mississippi River, each with an interest peculiar to itself. The plan is, by means of the canal, to divert such an amount of the water of Lake Michigan into the Mississippi as to give the Chicago River a backward current sufficient to carry off the sewage of Chicago, the fall toward the lake not being sufficient to give the river any current of account and making it little more than a big slackwater sewer, a nuisance and an eyesore from every standpoint.

When the work was undertaken the city asked no questions. It arranged to take a certain definite amount of water out of Lake Michigan without so much as inquiring whether there were any rights infringed upon by the transaction. For awhile the marine interests looked on without taking any steps to protect its interests. Chicago writers and engineers for the most part assumed that there would be no lowering of the level of the lakes, but in this they were so generally opposed by engineers not interested in the city's wants that the government at length appointed a board of three engineers to inquire into the matter. The board consists of General Poe, stationed at Detroit, Major Ruffner, at Buffalo, and Captain Marshall, at Chicago. The time of meeting has not been set, but is expected to be during the present summer.

The estimates of the amount that the canal will lower the lake level vary from a matter of three inches to about nine inches. Finding that this limit was likely to cover the actual fact and finding, curiously enough, that there are no data by which anything short of the actual experiment itself is sufficient to settle the question, there was consequently a deep interest in the result to navigation from the loss of these depths of water. Major Ruffner, at the suggestion of President Frank S. Firth, of the Anchor line, the lake line of the Pennsylvania Railroad, asked Secretary C. H. Keep, of the Lake Carriers' Association, to make an estimate of the loss of carrying capacity to the lake fleet at lowered levels of three, six, and nine inches.

The work was very carefully done, and the accuracy of it in a general way is not to be doubted, for an actual consideration was made of all the lake craft that would be affected by the fall of water. Mr. Keep's conclusions are little short of startling. Without going over the long report, the following quotation will give the gist of it: "A lowering of the lake levels by three inches would produce a diminution of the carrying capacity to the lake fleet in a season amounting to 1,142,370 tons. A lowering by six inches would diminish the carrying capacity 2,284,740 tons. And a lowering of the lake levels amounting to nine inches would diminish the carrying capacity 3,427,110 tons. Turning these results into dollars and cents, and estimating the earnings of lake vessels at an average of 50 cents per ton of cargo carried, over and above cost of loading and unloading, a lowering of three inches would diminish the earnings of the fleet in a single year $571,185; a lowering of six inches would diminish the earnings $1,142,370; and a lowering of nine inches would diminish the earnings $1,713,555.

The report concludes with calling attention to the fact that the tendency of the new tonnage is almost entirely in the direction of deeper draught, so that the loss would increase year by year. Major Ruffner regards the report as one of the most important documents of its kind and says that the showing is such that the lake interests could afford to furnish Chicago a plant for disposing of her sewage by the dry process rather than to allow the canal to be completed and used.

ANOTHER RACE OF CARRIAGES WITHOUT HORSES.

We chronicled not long ago a trial of speed in France between carriages propelled without horses, the results of which trial were not very satisfactory. We have now to record a second race of the same character, in which a number of vehicles took part.

This race began in Paris on June 11; the course was from Paris to Bordeaux and return. The distance was about 360 miles from Paris to Bordeaux. Under the conditions of the race only four-seated carriages could compete for the first prize of 40,000 francs, or $8,000. Special prizes were also to be awarded to automatic and petroleum velocipedes; 66 horseless vehicles propelled by petroleum, steam power or electricity and five or six petroleum bicycles competed. The preliminaries were arranged with great care, checking stations being provided to insure the integrity of the race. Special telegraph wires were laid along the route to transmit news of the progress of the race to Paris. The race was witnessed by many thousand people on the line of march. The first vehicle to arrive at Bordeaux was MM. Panhard and Levassor's petroleum carriage, which reached Bordeaux at 10:32 on Wednesday morning, the start having been made at Versailles at nine minutes past noon the previous day. A stop of only four minutes was made, when the return trip was begun. M. Levassor's time to Bordeaux was 22 hours 28 minutes over a distance of 585 kilometers (363 miles). The speed was 24 kilometers 400 meters per hour, equivalent to about 15 miles. Many of the vehicles met with accidents on the trip. Carriage No. 6 ran over a large dog, the result being that a wheel was broken and the vehicle upset. No. 14, a petroleum bicycle, caught fire and was obliged to be abandoned at Angouleme. Though the two-seated carriage (No. 5) of MM. Panhard and Levassor arrived first, it received only second prize, the first prize being taken by the four-seated carriage of Les Fils de Peugeot Freres; the third was taken by a two-seated vehicle by the same party, as was also the fourth, which was for a four-seated vehicle. The carriage of MM. Panhard and Levassor met with an accident shortly after leaving Bordeaux, which delayed it over an hour, which makes the run more creditable. This carriage made the entire trip in 2 days and 53 minutes for the round trip of 1,170 kilometers (727 miles), being at the average rate of 14·9 miles an hour. Many of the other vehicles made splendid time.

The contest was arranged by Mr. James Gordon Bennett, Baron de Neufeldt, and others, who it is said paid for the prizes. The automobile carriage of to-day is in its infancy, but with the stimulus of such races as the present for substantial monetary prizes, the development cannot fail to be rapid. When the machinery shall be still more simplified, we may expect to see the automobile carriage come into extensive use.

In this connection we give in another column illustrations of some of the earliest examples of steam carriages, continued use of which was prevented probably owing to the bad roads then existing. Fine roads are almost an essential for the successful working of this class of machinery.

Speed in Milling Work.

Mr. Oberlin Smith in a recent article on "Shops Economy," in Cassier's Magazine, says: "Do not allow a workman to think that 16 feet cutting speed per minute on soft cast iron is good enough, because he did it yesterday or last year, or because his grandfather did it. Show him by a definite object lesson that there is no trouble in doing a good deal of lathe, planer and drilling work at from 25 to 35 feet per minute, even when dry. Milling work may often be done very much faster than this, in some cases approaching 100 feet per minute, on account of many of the cutting edges being out of action and having time to cool. In certain special cases, where an abundant amount of lubrication can be forced constantly past the cutting edge of the tools, as in drilling deep holes in gun barrels, etc., speeds as high as 3,000 feet and over have been attained, and 1,800 feet per minute is a very common speed. All this goes to show what every workman ought to know and have drummed into him every day of his life, that there is no hidden mystery about a tool 'standing.' Let him understand, once for all, that a steel tool will cut chips off pieces of softer metal at any rate of speed desirable, provided it can be kept cool. Emphasize the fact that it is all a matter of temperature, and if the tool can be kept cool, mere velocity of cutting does not count against it." These important facts should be constantly kept in mind by those who are responsible for the machine shop practice in railroad shops. We are not exaggerating when we say that in some of these shops things move pretty slowly. Even the men get into a gait that corresponds more or less with the speed of their machines, and a more rapid movement of the latter would undoubtedly make the men more active also. It is worth trying, for there is economy in it.

St. Louis.

The authorities of the city of St. Louis, in recognition of the compliment paid to their metropolis by the naming of the great steamer St. Louis, made very generous and beautiful presents to the ship, among which were the following:

"1. A library for the first cabin, consisting of 1,622 carefully selected volumes, handsomely bound and numbered.

"2. A library for the second cabin, containing 639 volumes, also especially selected.

"3. Two hundred copies each of hymnals and prayer books, especially bound and bearing the names of the ship and the donors.

"4. Two handsomely bound albums, containing each fifty photographic views, with descriptive matter covering a brief history of the city and of each picture.

"5. A monograph descriptive of the new Union Station, donated by the president thereof.

"6. Ten ornamental glass windows for the first cabin library room; and

"7. A full set of flags, including the American ensign and the house flag in silk, and a burgee bearing the name St. Louis."

The American Society of Mechanical Engineers.

The annual meeting of the American Society of Mechanical Engineers will take place at Detroit, Mich., and will be held from June 21 to June 28. Arrangements have been made for visiting various engineering works and points of interest, such as the St. Clair tunnel, the works of the Public Lighting Commission, etc. A reception will be tendered by the citizens of Detroit to the society at the Detroit Club. A number of interesting professional papers will be presented. The president of the society is E. F. C. Davis; the secretary is F. R. Hutton, and the treasurer is William H. Wiley. The headquarters of the society are at 12 West Thirty-first Street, New York City.

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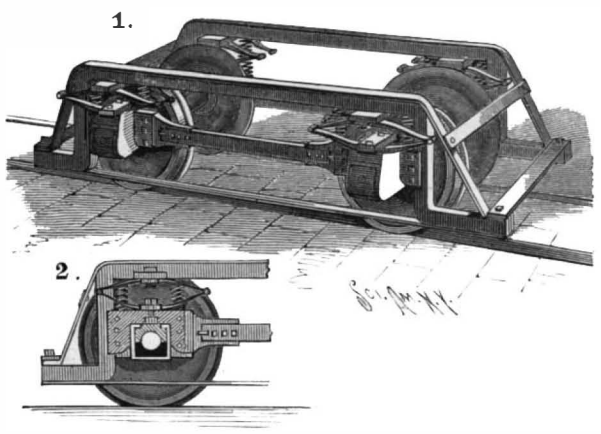
AN IMPROVED CAR TRUCK.

This truck is designed to reduce the friction of the bearing parts to a minimum and take up the side and end thrust, relieving the truck frame of the heavy strain incident to the motion of the car. It is intended more especially for use on street railway cars. A patent has been granted for the improvement to Mr. George B. Esterley, No. 28 Hartwell Street, Fall River, Mass.

The sides of the frame each consist principally of a single bar of square steel whose vertical sides terminate in horizontal ends, as plainly shown in Fig. 1, and in each of the sides are two car axle boxes, rigidly connected by bars fastened by bolts to the boxes, there being a key at the end of each bar to facilitate its proper adjustment with the boxes, and the holes through which the bolts pass in the boxes being slightly elongated for this purpose. The axle boxes



ESTERLEY'S CAR TRUCK.

have their outer ends fitted to slide on the inner faces of the vertical portions of the frame, and on the top of the axle brass, as shown in Fig. 2, is a lug fitting in a recess in the under side of the top of the box, this lug engaging a vertical bolt in the top of the box, to prevent accidental displacement of the axle brass in the box.

Above each box are elliptical and coiled springs adapted to sustain the load, dividing the strain with the boxes and thus relieving the truck frame. To take up any side thrust, a thrust plate is fastened to the outer end of each axle box, the plate extending into the outer face of the vertical portion of the frame, and another thrust plate is also secured to the inner face of each axle box to engage the inner face of the vertical portion of the frame. An oil casing, having at its rear end an opening for the passage of the axle journal, has at its front end a door for the introduction of the lubricant, the top of the casing having an aperture through which extends the top of the axle brass. The outer faces of the sides of the oil casing fit snugly on the inner faces of the sides of the axle boxes, and on the rear end of the casing is a dust plate. With this improvement the axle brass is readily removable for examination or renewal when desired.

Why the Maple Sap Flows.

The maple tree is active in the summer and passive in winter. Pressure, suction and zero are conditions of the tree when not in leaf, when at rest and passive. Varied weather, as to temperature, is the cause of these varied conditions. Under certain conditions the whole tree may be in pressure, or the whole tree may be in suction, or it may stand at zero. Again, a part of the tree may be in pressure while another part of the same tree may be in suction.

When the tree is in pressure it is throwing out moisture sap whether tapped or untapped. When the tree is in suction it is reversed, taking in moisture or water whether the tree is tapped or not. When the tree is tapped the pressure becomes visible. To make the suction visible, connect a glass tube to the spout (a round wooden one) by rubber, fill the tube with water or sap, or even sirup (when the tree is in suction), and you will see the contents passing down the tube, and of course the same is passing into the tree. Pressure and suction exist all the same if the tree is not bored, but, being unseen, it is recognized little even by vegetable physiologists.

Pressure can be measured with the steam gage, and also with a mercurial gage, while suction can be measured with a mercurial gage only.

The highest pressure that I have noticed was 34 pounds on a square inch. This would hold a column of water over 60 feet high. The pressure of the atmosphere at the sea level is 15 pounds upon a square inch. This amount of pressure is exerted on every square inch outside surface of the tree, and is balanced by the same amount of internal pressure, so that the 34 pounds pressure, internal, was in excess of the outside pressure; hence, even if the tree is not tapped, there must be moisture passing to the surface through the pores and connecting with the atmosphere until equilibrium is restored, and suction or zero is reached.

If certain conditions produce pressure, then reversed conditions must produce suction, the opposite condition. When the tree is neither in pressure nor suction, then its condition is zero. In good sap weather, as a general law, the tree is in pressure during the day and in suction through the night. In poor sap weather zero conditions prevail.

Pressure. What is it? This can only be understood by an understanding of the internal makeup of the tree. It is supposed that there are 100,000,000 cells in every cubic inch of maple wood. These cells are supposed to be like small boxes, with covers, piled one upon another, so that there are two partitions between every box or cell. These cells are filled with gases, air and water, together with some other materials or elements. Now, then, we are prepared to understand the philosophy of the pressure. As the sun warms up the outside of the tree, the air and gases expand in all the cells so warmed up, occupying a larger space, so that the pressure must be proportionate. It is not so much the expansion of the cells as it is their expansible contents.

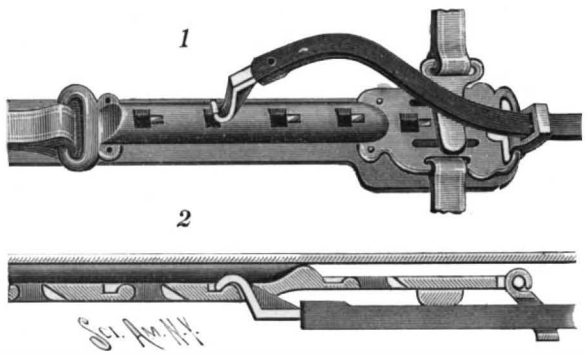
The moisture or watery parts are forced out through the pores of the tree, and if a small maple tree is carefully scraped to the wood, instantly the whole surface will be covered with tiny drops of moisture, showing what is taking place all over the surface. If, then, a tree is bored, the pressure is liberated so much, and if a gage is attached to the tree, it will show it, and even measure the amount. Now, then, a vacuum results. As a cool night is coming on these expansive elements are contracting, thus doubly increasing the vacuum. Now, then, pressure changes to suction, and the glass tube shows it. The equilibrium of the tree is restored.—New York Tribune.

The Bicycle Lamp.

"There is a fortune awaiting the man who can invent a really good bicycle lamp," said the instructor. "The best one made is the searchlight, which cannot be bought for less than $5; it is the only one in which kerosene can be burned, sperm oil being used in the others. The great advantage of the searchlight is that it is less liable to go out in running across car tracks, ruts, or rough places, but a sudden jerk often extinguishes the light in this, as well as in the cheaper and less ingenious lamps. The truth of the business is if cyclists could buy a well perfected lamp there would be none of these arrests of persons for riding without lights. Lamps cost all the way from $1.50 up to $7, and will hold enough oil to burn about four hours."

AN IMPROVED HAME TUG.

The hame tug shown in the illustration permits of readily shortening or lengthening the trace, causes a straight pull from the hame to the singletree and simplifies changing the back band from one harness to another. It has been patented by Mr. Charles Hoberecht, Sedalia, Mo. The tug is made with a plate riveted to a band of leather, there being in the plate a series of apertures, each terminating at its rear end in a slot with beveled back, the apertures being adapted for engagement by a hook at the front end of the trace, as shown in Fig. 1. The hook has at its rear a brace which rests in the slot at the rear of the aperture with which the hook is engaged, as shown in the sectional view, Fig. 2, a double bearing being thus made in the tug plate, and the accidental detachment of the hook being prevented. At the outer end of the head of the plate the trace passes through a guide loop which may be turned up or down or toward the front or rear to insure a straight pull, and the trace may be hooked upon the guide loop to make a longer hitch. At the forward end of the tug plate is an angularly arranged loop to be engaged by a strap connected with the hame, the eye formed by the strap being held out so

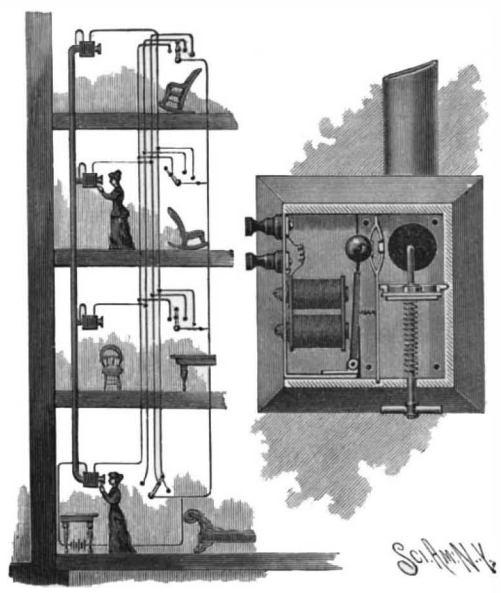


HOBERECHT'S HAME TUG.

as not to injure or rub the skin of the animal. On the lower side of the plate is an opening engaged by the belly band, and in the plate are two slots engaged by the buttons of a buckle, which has an eye engaging the saddle or back band, the latter being thus permitted to slide backward or forward to fit large or small horses. The arrangement is such as to permit the back band to be readily changed from one harness to another without unbuckling the billets or the strapwork on the harness saddle and without danger of accidental displacement.

AN ELECTRICALLY CONTROLLED SPEAKING TUBE.

The improvement represented in the illustration permits of conveniently connecting with each other any two rooms in dwellings, stores, hotels, apartment houses, etc., or the apparatus may also be arranged in connection with a central office, in which case an alarm may be sounded in each room for fire or other cause. The invention has been patented by Mr. George S. Williamson, of McKeesport, Pa. The engraving shows a section of an apartment house in which the improvement is in use, the small figure being a sectional front view of the signal box, in which is inclosed a speaking tube inlet and mouthpiece, a valve controlling the connection between the mouthpiece and whistle, while an electric circuit is provided with electromagnets, the armature lever being controlled from the whistle. On each of the floors the main tube is connected by a branch tube with a signal box whose mouthpiece opens into a chamber which is disconnected from an adjoining chamber by a spring-pressed valve, the valve being opened by a handle extending through the base of the signal box. In the wall of the second chamber, and between it and a third chamber, is a whistle, there being in the latter chamber a pair of magnets and an armature lever carrying a ball closing the inner aperture of the whistle, so that when a blast of air passes into the second chamber, either from the branch tube or from the mouthpiece—



WILLIAMSON'S ELECTRICALLY CONTROLLED SPEAKING TUBE.

the valve being then open—the air sounds the whistle, provided the armature lever is being attracted by its magnets. The latter are connected with switches on each floor, a wire connecting the several switch levers with each other and with a wire leading to the battery, the main tube also serving as a conductor. A party on any of the floors can thus, by moving the switch lever to the desired contact point of another floor, call up the party thereon to establish communication between the two floors, the completing of the circuit attracting the armature lever and permitting the sounding of the whistle in the signal box of the floor to be communicated with. When the improvement is arranged for use in connection with a central office, there are no switchboards on the several floors, and the wires terminate at the switchboard in the central office, where the connection is made by an attendant.

Test for Arsenical Wall Papers.

Anyone who suspects the presence of arsenic in their wall paper can put the accuracy of their suspicion to the test in the following simple manner: Dip a small piece of the paper in strong ammonia water. If arsenic is present, a bluish color will appear. In order to make doubly sure, a crystal of nitrate of silver can be moistened with a drop of this fluid. This further test will show if the color is due to arsenic, as, if it is, a deposit of yellow tint will be formed on the crystal.—Exchange.

[The above is a good instance of fallacious chemical tests which appear from time to time for the "information" of the public. The blue color produced by ammonia simply indicates copper, and a test for copper cannot be accepted as a test for arsenic. The nitrate of silver reaction is far from easy to produce satisfactorily in the laboratory; à fortiori, it is not to be recommended for use by the unprofessional. The best test for arsenic in wall paper is to send a sample to a competent chemist for analysis.—Ed. S. A.]

LAVOISIER, the chemist, is to have a statue in Paris, the Institute of France having started an international subscription for the purpose. It was a hundred years ago last year that the Revolutionary Tribunal sent him to the scaffold, refusing his request for a delay until he had completed his experiments. Fouquier Tinville then declared that the republic had no need of learned men.

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HISTORY OF AUTOMOBILE CARRIAGES.

About two years ago we gave a description of a steam carriage constructed in 1833, by Francois Macerone and Squire. We at that time recalled the fact that the first steam carriage was due to Joseph Cugnot, who was born in Lorraine, September 25, 1725. Cugnot passed his youth in Germany, where he studied mechanics with much ardor, and soon obtained employment as an engineer. He afterward lived in the Netherlands and made himself remarked by Marshal de Saxe, by devising a new style of gun, which was soon adopted for the army of the Uhlans. Encouraged by this first success, he went to Brussels, and resolved to construct steam vehicles which he called steam trucks, and which he designed for the carriage of guns and artillery material. In 1763, he went to Paris with the resolution of pursuing his labors, and there succeeded in constructing a style of steam carriage, which he finished in 1770. An old memoir of the Archives of Artillery informs us that Cugnot's apparatus was examined by General Gribeauval, and that Minister Choiseul proposed to request the inventor to have his apparatus operated in his presence; but the minister having soon afterward been exiled, "the carriage," says L. N. Rolland, the reporter, "remained where it still (1801) stands, in a covert of the arsenal."

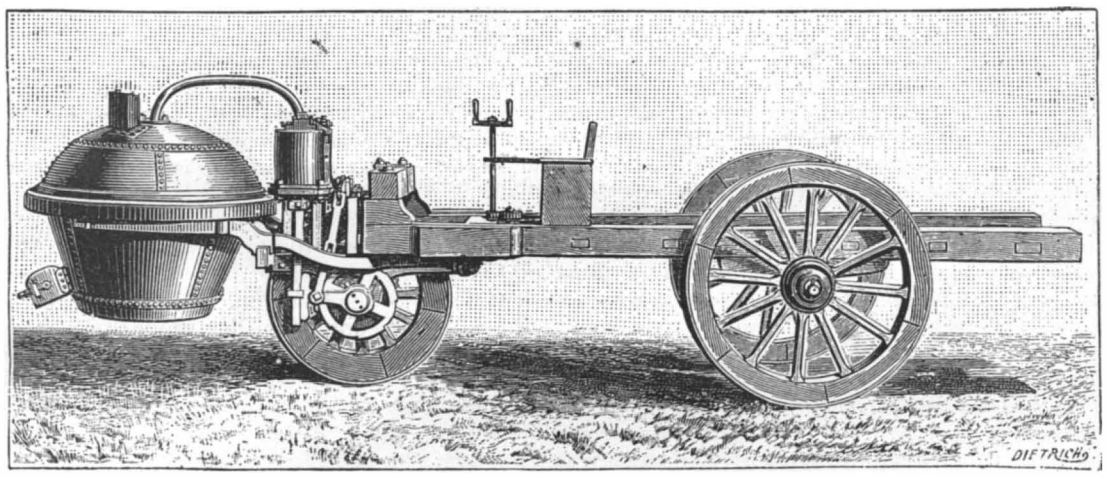

Fig. 1.—THE CUGNOT STEAM CARRIAGE OF 1770.

Tradition relates that Cugnot tried his machine and made it operate, but that in an unfortunate experiment the vehicle deviated from its route and ran against a wall, which upset it. The trials were thus interrupted. In 1793 the Committee of Public Safety was desirous of taking this machine apart in order to make arms of it, but it was spared by the artillery officers, and in 1799 was saved for good by Molard, the guardian of the Conservatoire des Arts et Metiers, who demanded it for the galleries of this establishment. It was not till 1801 that Cugnot's steam carriage reached the Conservatoire. It is still there, and visitors examine it with interest. We reproduce it herewith, from a photograph that we have had taken for our readers (Fig. 1). This carriage was run by a simple acting steam engine having two bronze cylinders. The boiler, which was mounted in front, was enveloped in refractory clay. The carriage, which had three wheels, constituted a true tricycle. Cugnot died in 1804, at the age of 79 years.

In 1786 an American, Oliver Evans, of Pennsylvania, who who had long been occupied with mechanics, constructed a high pressure steam engine that he desired to employ for the running of a carriage; but he was everywhere coldly received by his fellow citizens. He went to Philadelphia, and, after working there, earned enough money to make it possible to begin the construction of his steam carriage, which, in 1800, after spending all that he possessed, he had the satisfaction of seeing operate. He undertook the manufacture of his high pressure engines and succeeded in creating extensive factories in Philadelphia, but in 1819 his works were completely destroyed by fire. The unfortunate inventor, who had intended to take up his carriage again, died of a broken heart. Evans had often sent his plans to England, where they were known to a few engineers. In 1801, two mechanicians of Cornwall, Trevithick and Vivian, constructed some high pressure engines analogous to those of Evans, and were led also to construct steam carriages. Fig. 2 represents the carriage of these builders. The vehicle was very high above the ground. A strong iron frame was fixed to the axle behind, between the two wheels, and served as a support for the furnace, around which a reservoir filled with water became heated and furnished steam to a horizontal cylinder. This latter was provided with a rod which, through a system of gear wheels, caused the revolution of the wheels of the carriage. This apparatus exhibited some ingenious arrangements, but it was still far from constituting a practical system for operating upon roads. The inventors recognized the imperfections of their work and converted it into a car for running upon rails in mines. Success did not crown their efforts, which nevertheless merit mention.

The experiments of Trevithick and Vivian were much talked about in England, but it is not till 1827 that we reach the construction of another curious steam carriage, due to a mechanician named Gurney. Fig. 3, from an English engraving of the time, renders a long description of it unnecessary. We translate the legend found beneath the engraving:

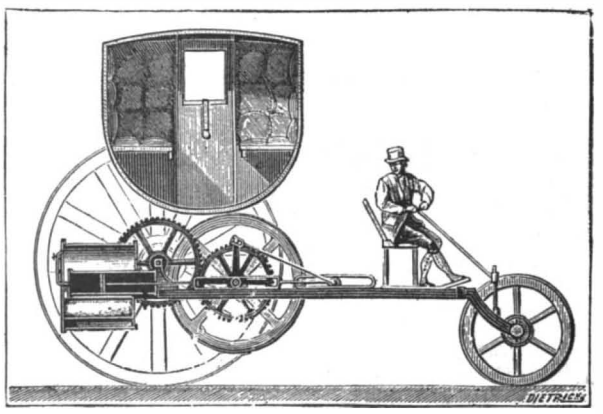

Fig. 2.—THE TREVITHICK AND VIVIAN STEAM CARRIAGE CONSTRUCTED IN 1801.

The driver is seated in front. He holds the steering bar of the two guide wheels, and has beneath his hand to the right a second bar connected with the main steam pipe. He thus assures the running of the vehicle. The back of the carriage contains the boiler producing the steam that passes through tubes into the cylinders placed beneath the carriage and sets the hind wheels in motion. The reservoir, which contains about 50 gallons of water, is inclosed in the box of the carriage, of which it occupies the entire length and breadth. The chimneys are behind, and, as coke is used, no smoke is produced, while the hot air is dissipated by the motion of the carriage. A supply of water and fuel is obtained at various relays. The length of the carriage is between 15 and 20 feet, and the weight about two tons. From one and a half to two leagues per hour can be made. The carriage has accommodations for six passengers in the inside and twelve on the outside. In front there is a receptacle for baggage. The inventor and builder is Mr. Goldsworthy Gurney.

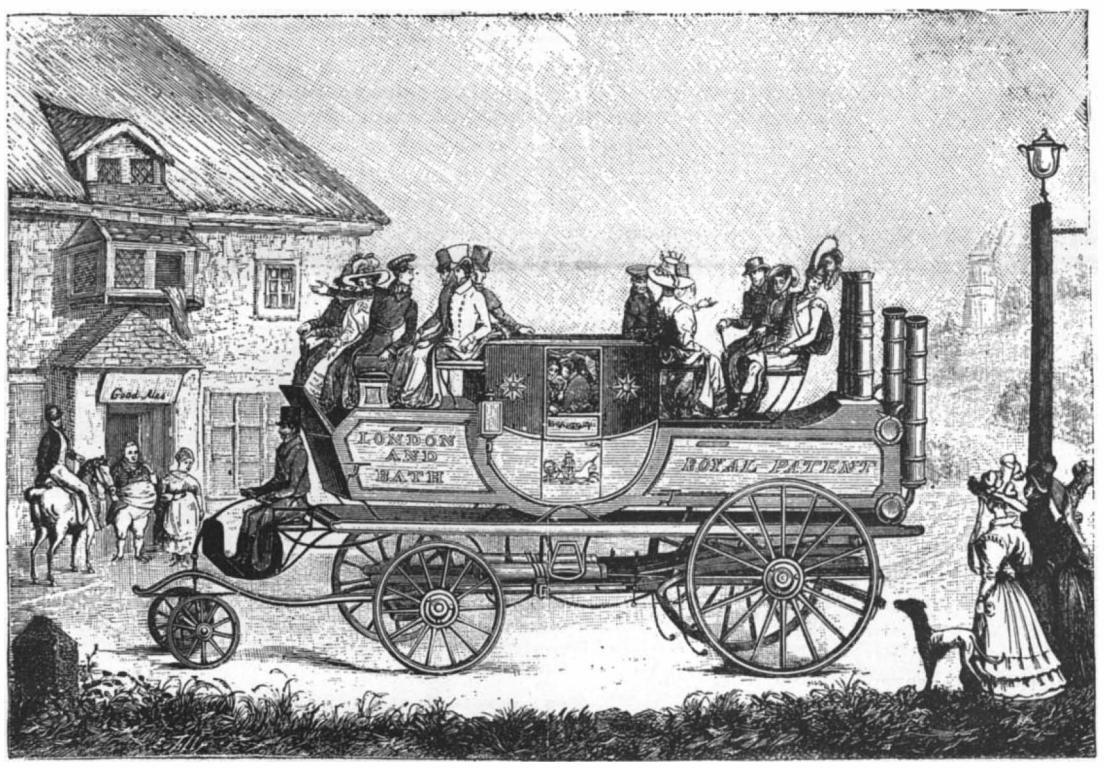

Fig. 3.—THE GURNEY STEAM CARRIAGE OF 1827.

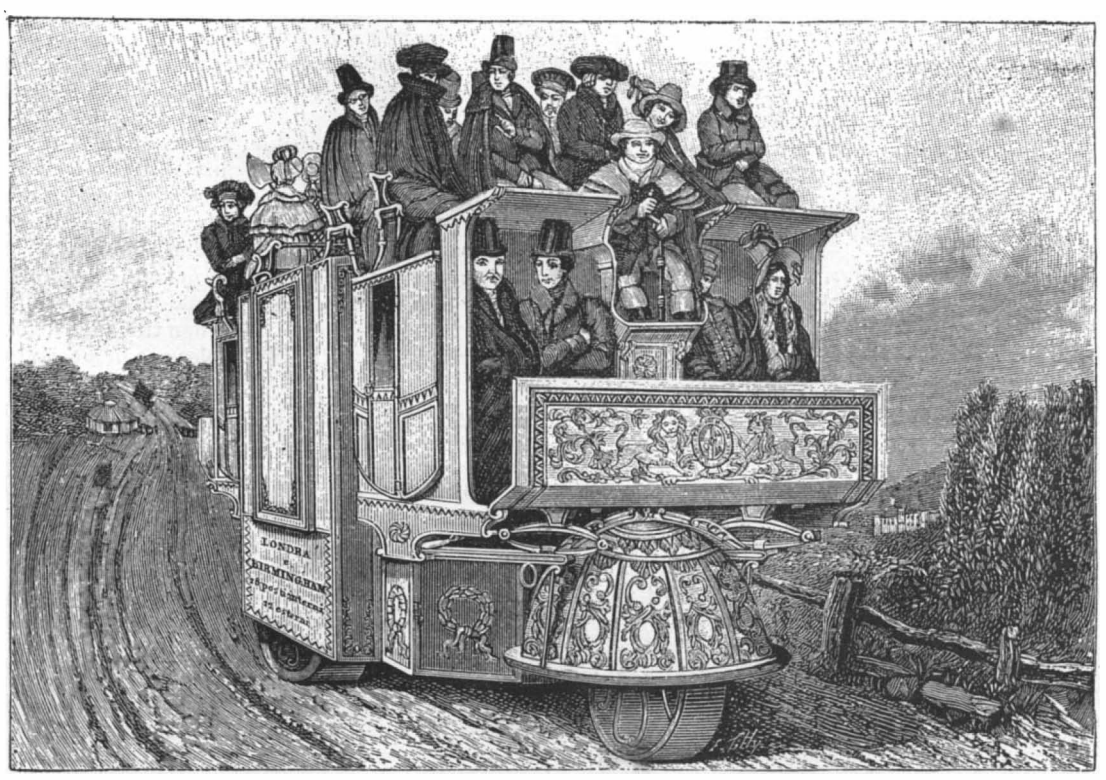

Fig. 4.—THE GHURCH AUTOMOBILE CARRIAGE OF 1833.

This carriage was operated, but we have in our possession only the engraving and its legend, which gives an incomplete description without mentioning the experiments or giving the least details whatever as to the motor. In this old engraving the reader will please observe the costumes of the passengers and the Bolivar hats. These were the fashions of 1827–1830. The lady seen in the group to the right wears a hat that was then called the "Tyrolian," and that was characteristic of the year 1827.

In 1833, six years after the construction of which we have just spoken, an Italian engineer brought out at Birmingham, England, the singular steam carriage that we reproduce in Fig. 4, from an Italian engraving printed in Milan. This vehicle was heavy and massive. It was actuated by a steam engine, and, according to the engraving, was capable of accom-

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modating a large number of passengers. Like the Cugnot carriage, it was a tricycle. We have no details as to the experiments made or the arrangement of the mechanism. It has appeared to us to be of interest to recall the efforts of these old inventors of automobile carriages. It was they who prepared the way for the solution of a problem which may now be considered as solved.—La Nature.

Professor McMaster's History of the United States.*

The fourth volume of this most interesting and valuable work is now before us, and fully supports the high standard of excellence which has marked the preceding volumes. The present book embraces the period from 1812 to 1820; a short period truly, but so crowded with events of importance and interest that it has required a volume of 625 pages for their narration.

Professor McMaster's style of diction is at once luminous, flowing and attractive. His perfect familiarity with every subject touched upon is apparent on every page. The first half of the volume relates chiefly to events during the war with Great Britain.

The military operations on the Canadian frontier are graphically described, as well as the naval demonstrations on the lakes and the ocean. The effects of the many naval successes of Americans are lucidly set forth. We subjoin a few extracts. Referring to the results and effects of the American naval victories and the operations Professor McMaster says:

"In the course of twenty years England had met and destroyed the navies of every maritime power in Europe. The battle of Copenhagen, the battle of the Nile, the battle of Trafalgar, had given her a reputation for invincibility which a hundred smaller fights served but to justify. But now, on a sudden, the captains of a people concerning whom the nations of Europe knew absolutely nothing had five times humbled her flag on the sea, and had demonstrated that her supremacy could not endure one hour longer than she continued to deserve it. And this is the lasting value of the victories of Hull and Decatur, Bainbridge, Lawrence and Jones.

"Had Englishmen attributed their defeats to lack of discipline, to ignorance of gunnery, to the general demoralization of their sailors produced by uniform success, they would have done no more than trace back effects to their causes. But they did not, and nothing was more diverting to Americans than the attempts of the English press to explain the defeats. 'The loss of a single frigate by us,' said the London Times, referring to the Guerriere, 'when we consider how the other navies of the world have been treated, is but a small matter. When viewed as a part of the British navy, it is nothing; yet it has cast a gloom over the city which it is painful to see. The superior weight of metal thrown by the Constitution, the greater number of men, the loss of the mizzenmast at the very beginning of the action, were all urged. But people look only at the triumph of the Americans—a triumph small enough, and of no importance, save as a reason for a rigorous scrutiny of the behavior of those responsible for it.'"

"This new defeat," said one journal, "calls for serious reflection—all the more serious when we put with it the fact that Lloyd's list shows five hundred British merchantmen taken by the Americans in seven months. Five hundred merchantmen and three frigates! Can this be true? Will the English people read this unmoved? Any man who foretold such disasters this day last year would have been treated as a madman or a traitor. He would have been told that ere seven months had gone by the American flag would have been swept from the ocean, the American navy destroyed and the maritime arsenals of the United States reduced to ashes. Yet not one of the American frigates has struck. They leave their ports when they choose and return when it suits their convenience.

"They cross the Atlantic, they visit the West Indies, they come to the chops of the Channel, they parade along the coast of South America. Nothing chases them; nothing intercepts them—nay, nothing engages them but to yield in triumph."

Describing the operations of the Yankee privateers, the author says:

"Such was their boldness that it was all but impossible to secure a shilling of insurance at Halifax for a homeward bound voyage or get a policy underwritten at Lloyd's for a trip across the Irish Channel. Thirteen shillings on the hundred pounds were asked and paid by vessels compelled to make the voyage. Three frigates and fourteen sloops of war were guarding the English seas, yet the capture of a privateersman was of rare occurrence. Such experiences were new to Englishmen, and on the twelfth of August the London Assurance Corporations petitioned for a naval force large enough and active enough to clear the British Islands of the privateers. They were assured by John Wilson Croker, Secretary of the Admiralty, that there was afloat a force adequate for the protection of trade both in St. George's Channel and the Northern Sea. But the capture of five brigs between the Smalls and the Tuskar; the absolute refusal of the underwriters to insure vessels bound for Ireland; and the admission of the Morning Chronicle that 'the whole coast of Ireland, from Wexford round by Cape Clear to Carrickfergus,' was blockaded by 'a few petty fly-by-nights,' made the assurance of Croker ridiculous. Now, at last, the sneer of the London Times in 1807, that Americans could not sail from New York to Staten Island without British leave, was reversed, and made applicable to Englishmen on their voyages from port to port of the British Isles. Even Croker was forced to admit this, and in an answer to a memorial from Bristol he told the merchants that if the masters of British ships 'had availed themselves of the convoys appointed for their protection from foreign ports, or had not in other instances deserted from the convoys under whose protection they had sailed,' there would not have been so many captures in the Irish and Bristol Channels.

"In the address made soon after by the Liverpool merchants to the Lords of the Admiralty, they complain of the burning and destroying of merchant vessels by privateers as 'a new system of warfare,' and call loudly for protection against American capture. At Glasgow, the merchants, ship owners and underwriters were so put out with the conduct of the Admiralty that an address was made to the Throne. The number of American privateers, said the address, with which our channels have been infested, the audacity with which they have approached our coast, and the success with which their enterprise has been attended, have ruined our commerce, humbled our pride and discredited the naval power of Britain, whose flag, till of late, waved over every sea and triumphed over every enemy. In the short space of two years above eight hundred vessels have been taken by that power whose maritime strength we have hitherto held in contempt. It is distressing, it is mortifying, that, at a time when we are at peace with all the rest of the world, at a time when we have declared the whole American coast under blockade, when we pay so heavy a tax for protection in the form of convoy duty, and when our navy costs so great a sum, we cannot traverse our own channel in safety nor effect insurance without excessive premiums, and that a horde of American cruisers unheeded, unresisted, unmolested, seize, burn, sink, destroy, our ships in our own inlets and in sight of our own harbors. Lloyd's list for June 3, 1814, gives the names of thirty-seven merchantmen captured in a few weeks. The privateer Perry, of Baltimore, took twenty-two in a cruise of three months. The Surprise destroyed thirteen ships and was chased sixteen times in the course of one hundred and three days. In another cruise of thirty days she captured twenty-one. The Governor Tompkins burned fourteen vessels in a cruise through the Channel. The Young Wasp was six months off the coast of England and Spain and the Harpy three months off the Irish coast and in the waters of the British Channel and the Bay of Biscay. Captain Thomas Boyle, who now commanded the Chasseur, was three months in British waters, and sent in a proclamation, to be posted at Lloyd's, blockading 'all the ports, harbors, bays, creeks, rivers, inlets, outlets, islands and sea coast of the United Kingdom.'"

* A History of the People of the United States, from the Revolution to the Civil War. By John Bach McMaster, University of Pennsylvania. In six volumes. New York: D. Appleton & Company, 72 Fifth Avenue.

A Ride Down a Lumber Flume.

In semi-tropical Fresno County there is a place which for risky, delightful sport beats all the toboggan slides on the continent. Think of the exhilarating joy of an uninterrupted slide of fifty miles through great forests, along the brinks of precipices and down rugged canyons, amid the wildest and most picturesque scenery to be found in the country—fifty miles without a break.

Such a thrilling experience has been made possible by the recent completion of the great Pine Ridge lumber flume. No other flume surpasses it, and it is doubtful if any other is equal to it, in length and grandeur of the scenery passed through in a journey from the summit of one of the high spurs of the Sierra Nevada to the plains beneath, fifty miles distant. The flume has just been completed to the little town of Clovis, twelve miles north of Fresno, and is fifty-two miles in length.

Flumes for floating lumber are so numerous in California that description is superfluous, except to say that this is in general like all others, consisting of boxes shaped like the letter V, and on trestles varying in height from a few feet to a hundred, depending on the character of the country traversed. The flume starts at Stephenson Creek, one of the tributaries of the San Joaquin River, at an elevation of nearly 6,000 feet above the sea, and after a winding course of fifty-two miles it terminates in a vineyard twelve miles out on the plains beyond the foot of the mountain. The V-shaped trough carries the water which floats the lumber.

The flume boats, in which the rapid journeys are made down the flumes, are simple. They are made the same shape as the V-boxes of the flumes. The upper end of the boats is closed by a board nailed across, but the lower end, which points down stream, is left open to let out the water which splashes over the sides of the boats from time to time. One, two or three short boards are laid across for seats, depending upon how many are to make the journey. A carpenter can manufacture one of these boats in less than half an hour. The boat is meant for only one journey, for none is ever hauled back for another voyage. Only a little preparation is necessary for a trip of this kind, and half a dollar will buy enough lumber for the boat, and a man is a poor carpenter indeed who cannot make his own vessel. The trip is made with but little danger. The principal trouble is, when once started, there are comparatively few places where one can stop. The current is generally so strong and so rapid that it makes landing impossible, and the voyager can only sit still and let the boat run.

The first ride down the Pine Ridge flume, from start to finish, was made in the winter, a few months ago. Many persons had passed over different parts of the distance as the flume was being built, but none had made the whole distance without stopping.—San Francisco Chronicle.

How Magnetism Affects Your Watch.

The general use of electric machinery, which has been brought about within comparatively a few years, has in many ways changed the previous arrangement of things. One of these changes has been in the manufacture of watches. When the first lighting plants were put in, they were visited by nearly every one in the vicinity. Then watch makers began to receive complaints that their watches would not keep good time. They would go too fast for a time and then would go too slow, and vice versa. It was some time before the real cause of the trouble was discovered; the parts of the watches had become magnetized by the powerful fields of the dynamo electric machines.

To demagnetize the watch would bring it back to its original condition, but a second visit to the lighting plant would again spoil its time-keeping qualities. The public soon learned to keep their watches away from the dynamo, and the watch makers have since found a way to make watches that are not affected by magnetism. Comparatively few of the timepieces in use, however, are non-magnetic, and the average watch is subject to these seasons of fickleness.

The exceedingly fine and exact construction of the watch is not realized by the average possessor of the article. An examination of the works of a watch shows the mechanism as now constructed, although very small in size, to be most accurately planned and executed. The changes of temperature are provided for, so that the movement is automatically adjusted. The main spring and train of gears are usually concealed, while the balance and hair springs are in full view when the case is open. Upon the regularity of the movement of the balance depends the time-keeping quality of the watch. On looking closely at the balance, you will observe that it is not a complete ring, but two halves supported at one end. These rings bear a number of large headed screws, placed at irregular distances, which give it the exact weight and balance required. These half rings will also be found, on looking closely, to be composed of two metals so closely joined that a difference in color alone gives evidence of the fact.

This arrangement of iron and brass, on account of their different coefficients of expansion and contraction with changes of temperature, has been so carefully constructed that with changes of temperature the balance assumes such forms as to give it a uniform rate of motion. The parts affected by magnetism are the balance and springs. The balance in an ordinary watch moves five times a second, eighteen thousand times an hour, and four hundred and thirty-two thousand times each day. But a slight change in the forces that move it are necessary to make a difference of several minutes each day. As the balance moves back and forth, the magnetism of the mainspring is pulling or pushing it. If this force was constant and always in the same direction, the watch would run uniformly. Such, however, is not the case. When the mainspring is tightly wound its magnetic poles are in a certain direction and in unwinding they are constantly changing, so that the direction of this force is also constantly changed. The effect on the balance is such as to cause the watch to run too fast sometimes and too slow other times.

Non-magnetic watches are made with these parts of a non-magnetic metal, so that they are not influenced by electric machinery. For testing watches a small compass is used. When placed over the balance, the needle will vibrate with the motion of the balance in proportion to its magnetism.—The Car.

A STATISTICAL bulletin just issued by the Treasury Department shows that in ten years there has been an increase of 1,257,554 American women "engaged in gainful occupations," while the increase of the number "employed in trade and transportation" reaches the surprising figures of 263 per cent.

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Correspondence.

How to Clean the Streets.

To the Editor of the SCIENTIFIC AMERICAN:

You were kind enough to give space to the subject matter of the cheapness and efficacy of street cleaning in Rome, which is, of course, largely attributed to cheap labor and less material to clean, as compared with the city of New York, the traffic here of horses being much greater.

My personal experience or observation in noticing the cleaning of streets in Europe by flushing under hydraulic pressure of some 50 pounds: At Lucerne, Switzerland, two men, one at either end of a block or street some 300 feet long, flushed the block absolutely clean and bright in not exceeding ten minutes; or 150 feet to one man in 10 minutes = 900 feet per hour = 7,200 feet in 8 hours, or less than 400 men to clean 500 miles.

Streets cleaned in Europe by this process are usually preferred by pedestrians to sidewalks.

I noticed that streets in many of the seaboard cities are flushed by sea water, leaving white salt coating without microbes.

The point in question is: What it would cost to place 18 inch mains down through the several dividing avenues of the city, from these take hose, as in Europe, to clean the side or cross streets in the manner used in Lucerne, also in other European cities using sea water exclusively. G. W. K.

New York, June 1, 1895.

Pedestrians Should Have the Right of Way.

To the Editor of the SCIENTIFIC AMERICAN:

In your article on "The Present Status of the Bicycle" (June 8) it strikes me you are too easy on the rider in his relation to the pedestrian. The latter is supposed to have the right of way in crossing a street or avenue, but it is a right that nine-tenths of the riders utterly ignore. With the great increase of the bicyclists, the pedestrian, especially if aged and feeble, is completely at the mercy of rough, careless riders and liable to be knocked down at any moment. And the women riders are quite as careless. Neither is the pneumatic tire any safeguard in case of collision, except at very low speed.

Last fall a lady waiting for a car close at hand was struck by a woman rider and knocked down. No bones were broken, but she was confined to the house all winter and has not yet regained her usual strength. A few nights ago, passing into Washington Park, a lady was struck by a wheel going at such a high speed that she was knocked ten feet, her arm broken in several places and other severe injuries. No bell was rung, no light shown. The only excuse made by the fellow to the lady's husband was: "She got in my way."

That seems to be the popular idea among wheelmen —"We have the right of way; keep out of it if you don't want to be hurt." In most cases, when they do strike any one, they scuttle away without apology or inquiry. It has become exceedingly dangerous to cross the avenue of Washington Park, even by day, so numerous and so reckless are the riders. What is needed is rigid restriction, where pedestrians are numerous, to a moderate rate of speed. Merely insisting on the use of bells and lights is not enough. A few arrests of high-speed riders, promptly and universally done, would have a wholesome effect.

Albany, N. Y., June, 1895. WM. H. COLEMAN.

Milk as a Diet.

To the Editor of the SCIENTIFIC AMERICAN:

I recently tried the experiment of living thirty days with only sweet milk as a nourishment. At the beginning I had no difficulty in changing my diet from solid to liquid. During the thirty days of the experiment I lost five and one-half pounds in weight, but I lost no strength. I think that I lost the weight because the weather was warm, and because I took so much exercise. I rode a bicycle considerably during the time, and used 16 pound dumb bells and other heavy weights every day (except Sundays). I took much more exercise than I usually take, as I was determined to test the thing fairly. On the seventh day of the experiment I ran several foot races with a skillful runner, and was beaten in each race. On the thirtieth day I ran some more races with the same person, but did better than in the first races. This fact proves that I lost no strength. I took four pints of milk daily for the first three weeks of the experiment, and five pints daily for the last week. I think that a healthy person should take about five pints of milk daily when no other food is being taken. I drank milk after intervals of two hours during the day, commencing at seven o'clock in the morning and continuing till ten o'clock at night. Then I would take no more till the next morning.

My principal reason for trying the experiment was to endeavor to establish the fact that persons convalescing from sickness may grow stronger with no other nutriment than sweet milk, and that they are not obliged to take "something solid" to eat, as so many people imagine. Many a convalescent has gone to his grave as a result of overtaxing his weak stomach by putting "solid" food into it. The result of the experiment also shows that the old belief that "bread is the first essential of (human) life" is erroneous.

I believe that a man could live for any length of time, and take heavy exercise all the while, with no other food than sweet milk. H. F. WHITE, M.D.

Crawfordville, Ga.

Science Notes.

Invention of the Barometer and Mercurial Thermometer.—Mr. Hellmann devotes an interesting article in the Meteorologische Zeitschrift to the history of the invention of the barometer. Torricelli, who died at the early age of 39, gave a description of the barometer in a letter written June 11, 1644, to his friend Ricci. The denomination of the barometer is due to Robert Boyle, who used the apparatus along about 1659, and it was in France that the first continuous observations were made.

Mr. Maze recently pointed out the fact, before the French Academy, that sixty-two years before Fahrenheit made such an instrument, a mercurial themometer was used by Ismael Boullian (1659). It had an arbitrary scale, the value of a degree being about 10·7° C., and the zero of the scale at —53·76° C. The temperature of melting ice would be 5·34° and that of boiling water 15·27°.

New Ore of Thallium.—Nature announces the discovery, by Mr. Krenner, of Budapest, of a new ore of thallium, which has received the name of lorandite. This new ore is found associated with realgar at Allchar, Macedonia. It presents itself in the form of monosymmetric transparent crystals varying in color from carmine to kermes red. Its formula is $TlAsS_2$.

Electrolytic Determination of Poisons.—In a memoir presented to the Congress of Hygiene of Liverpool, Mr. Kohn shows that electrolytic analysis has made such progress in recent years that it might be advantageously employed for the detection of metallic poisons in medico-legal investigations.

In the case of antimony, lead, copper, mecury, cadmium, etc., this method would permit of revealing the presence of a tenth of a milligramme of the metal. Electrolytic analysis is much more sensitive than any other process, especially in the presence of organic substances.

Phosphorescence at Low Temperatures.—Continuing his researches upon the behavior of gases at low temperatures, Professor Dewar has ascertained some interesting facts which he has embodied in a lecture recently delivered before the Royal Institution. Operating at the temperature of the ebullition of air, that is to say at 190° below zero, he has found that many common objects, such as cotton, leather, silk, and feathers, acquire phosphorescence. On the contrary, the photographic plate loses its sensitiveness in a great measure, and is not readily affected by light.

Protection of Iron and Steel from Rust.—According to Invention, Professor Calvert has reached the conclusion that the carbonates of potash and soda possess the same property of protecting iron and steel from rust as do these alkalies in a caustic state. Thus it is found that if an iron blade is immersed in a solution of either of the above carbonates, it exercises so protective an action that that portion of the metal exposed to the influence of damp atmospheric air does not oxidize, even after so long a period as two years. Sea water, to which the carbonates in suitable proportions have been added, is said to produce similar results.

Restoration of Old Bindings.—The Petit Bibliophile gives, over the signature of its editor, the following method of renovating the bindings of old books so as to make them look as if newly bound.

After wiping the work with a very soft rag in order to remove every particle of dust, a fine sponge saturated with alcohol is passed over the binding; after which, there is applied with a camel's hair pencil or a little wadding, as rapidly as possible, a coat of varnish composed of the white of an egg dissolved in a third of its volume of 90 per cent alcohol.

Artificial Rubber.—According to Invention, a substitute for rubber has recently been discovered by E. Desprez, of Paris. Gutta percha in sheet form is taken and covered on one side or both sides with a close-meshed fabric (even wire gauze may be used for some purposes) and the whole is conglomerated by pressure under heat. Saw dust, zinc dust, and other suitable and cheap substances may, it is said, be incorporated with the gutta percha.

An artificial rubber of more or less strength may also be obtained by dissolving four parts of nitro-cellulose in seven parts of bromo-nitro-toluol. Upon varying the proportion of the nitrocellulose, a material may be obtained that possesses elastic properties and closely resembles India rubber, and even gutta percha. If desired, nitro-cumol and its homologues may be used instead of bromo-nitro-toluol.

As the base of a product designed to replace India rubber and gutta percha, Mr. Le Brocquy, says the Revue Scientifique, proposes to employ the composition used for making printer's rollers, that is, a mixture formed of variable proportions of glue, glycerine, and molasses. This composition is to be covered with canvas, ordinary rubber or any other material suitable to protect it against humidity, great heat or any mechanical action. Although glue, glycerine, and molasses form the fundamental basis of the new compound, the inventor reserves the right to modify his product by the addition of other substances.

Utilization of Blast Furnace Gas.—The well known English engineer, Mr. Thwaite, proposes to utilize the gases that escape from blast furnaces for the production of motive power by causing them to pass into a special motor.

The utilization of such gas would permit of urging the draught of the blast furnaces and of increasing their rendering by 45 per cent. The motors might, moreover, be employed for other purposes and effect a great saving, since, with high tension electric transmissions, the power may be utilized at great distances under very satisfactory economic conditions.

The power produced might be used, too, in the villages within a radius of 15 miles either for the transmission of motive force or for electric lighting. Mr. Thwaite asserts that this method would permit of assuring the latter service at a cost much less than lighting by gas.

Plowing by Electricity.—An electric plow has been brought out by Messrs. Zimmerman & Company, of Halle, Germany. A chain is stretched around the field in which the apparatus is to be used, and runs over a sprocket wheel on the motor, which is thus able to wind itself along and drag the plow after it. The cable to the motor is carried on a number of small trolleys running over the ground. The length of the cable is sufficient to reach across the field, as the motor, as it winds itself backward and forward, swings the cable over the ground. By starting work on the side nearest the motor and working up the field away from it, the cable does not foul the plow. The trials of the installation are said to have been exceedingly satisfactory.

The Vitality of Seeds.—Some interesting notes on the vitality of seeds have recently been contributed by Mr. W. B. Hemsley, F.R.S. Referring to the question of mummy seeds, Mr. Hemsley agrees that carefully conducted experiments do not support the usual ideas entertained in regard to the vitality of Egyptian wheat and peas. Contrariwise, he admits that some seeds do retain their vitality for very lengthened periods, not comparable, however, to the legendary extent of life of the mummy wheat. He mentions seeds of the sensitive plant which germinated after being kept in a bag for sixty years at the Jardin des Plantes. From twenty to twenty-five years is a common enough period during which seed vitality may remain unimpaired. One case is quoted from Tournefort, from whose herbarium, it is said, kidney beans were taken, with the result that after one hundred years' still life they germinated. Lindley states that raspberry plants were raised from seed which had been taken from the stomach of a man whose skeleton was found buried thirty feet deep. Coins were found at the same place from 1,600 to 1,700 years old. Also, some twenty years ago, when the slack of ancient Greek silver mines was cleared away, some plants previously unknown in the locality sprung up. Here the suggestion is that the seeds had remained dormant since the classic ages, and sprang into vigor when the covering soil was removed. But, at the very least, we may conclude that possibilities of errors of observation are included in such instances, and that it is perhaps safer to assume that questions of plant vitality may be bounded by limits of much more modest dimensions than a score of centuries.

Origin of the Word "Arsenic."—A correspondent of the Academy, dealing with this subject at considerable length, sums up by assuming that the Greeks, as early as the fifth centnry B. C., borrowed, perhaps from the Persian, a word to which they gave the form sandarake, and applied it to the red sulphuret of arsensic, or realgar. Six centuries later, Dioscorides, wishing, perhaps, to find another word for the yellow sulphuret of mercury, or orpiment (which had possibly up to that time been included in the term sandarake), and finding in some other language, perhaps Arabic, a word with this meaning, viz, zarnik (or azzarnik), in which he discovered some resemblance to arsenikon, "male," boldly adopted this latter word, and gave it a new meaning. It is pointed out that the curious part of the matter is that, if this view is correct, sandarake and arsenikon would both appear to have been taken from the same Oriental word, modified somewhat, perhaps, both in form and signification in the course of centuries, and in its passage from one Eastern language to another.—Pharmaceut. Jour.

FIVE linotype typesetting machines were recently removed from the office of the Cincinnati Enquirer and set up ready for use in the office of the New York Morning Journal in thirty-six hours—a remarkable piece of work, considering the complicated nature of the apparatus

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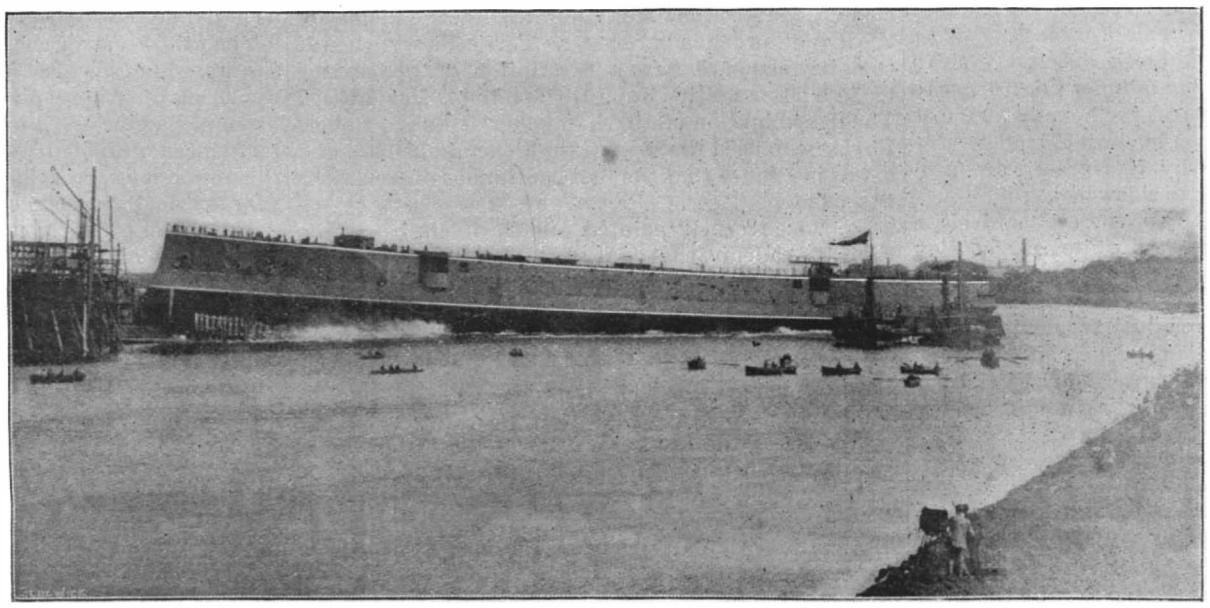
A GREAT WAR SHIP.

The British cruiser Terrible was launched on the 27th ult. from Messrs. J. & G. Thomson's yard, at Clydebank, near Glasgow.

The Terrible far exceeds in size any vessel of her class that has gone before. The Blake and Blenheim are 375 feet long and 65 feet wide, the displacement being 9,000 tons. The Terrible and her sister ship the Powerful, now under construction at Barrow, are each 500 feet long between perpendiculars, or 538 feet over all, and 71 feet wide, and are to be 14,200 tons each in displacement. In the machinery department the advance is hardly less marked. On trial the engines of the Blenheim, which alone of the two vessels was tried with forced draught, gave off 21,411 indicated horse power; the Powerful and Terrible are to be driven by engines exerting 25,000 horse power. On the natural draught trials, however, the Blake's propelling machinery gave out 14,525 horse power, with an air pressure equal to a head of 0·4 inch of water, that of the Blenheim 14,924 horse power, with an air pressure equal to 0·2 inch of water only. The chief feature of interest in the two new cruisers, however, is the manner in which the steam is to be generated to supply that power. In fitting water tube boilers to these important ships the Admiralty authorities have made one of the boldest and most important steps ever taken in the history of naval engineering. The ship has no fewer than 48 boilers, these being all of the Belleville water tube type. The Terrible has no side armor, the protective element being entirely confined to the armored deck, which extends over the whole length of the ship. The edges of the deck join the skin of the vessel 7 feet below the load water plane, and the deck rises amidships to 3 feet 6 inches above that level, so that in cross section the deck forms a flattened arch 10 feet 6 inches from the springing to the crown.

In regard to hull construction, the universal double bottom system has been followed, the virtues of which were so notably made manifest in the grounding of the Apollo and the Howe. The ship is extensively subdivided into watertight compartments. The armament of the Terrible will consist of two 9·2 inch guns, twelve 6 inch quick firing guns, sixteen 12 pounder quick firing guns, twelve 3 pounder quick firing guns, nine machine guns and two light guns. There will also be four torpedo dischargers. There will be four funnels, having a total height of 80 feet above the grate bars, and with these it is hoped to get the 25,000 horse power without forced draught.

One of our engravings, from Engineering, shows the appearance of the great vessel at the time of her launch. The other illustration, from The Engineer, gives an idea how she will look when fully rigged.



LAUNCH OF THE WAR SHIP TERRIBLE.

Molten Metal Shipped by Rail.

The Cleveland Rolling Mills Company has just inaugurated a novel system of metal transportation. They ship great pots of molten metal from their central blast furnace to their Newburg mills, five miles away. The trip consumes fifteen minutes, and about 500 tons are carried daily over the tracks of the Erie Railroad. At the rolling mills the car is raised on a hoist to the mixer, the ladle is tipped by machinery and the metal poured into the mixer.

Novel Lighthouse.

The lighthouse that has been erected by the lighthouse board at Paris Island, Port Royal Sound, South Carolina, is novel in form, and, though erected as an experiment, it has done its duty well. It is the most economical structure in the history of lighthouse construction. When first erected it was regarded with many misgivings by experts.

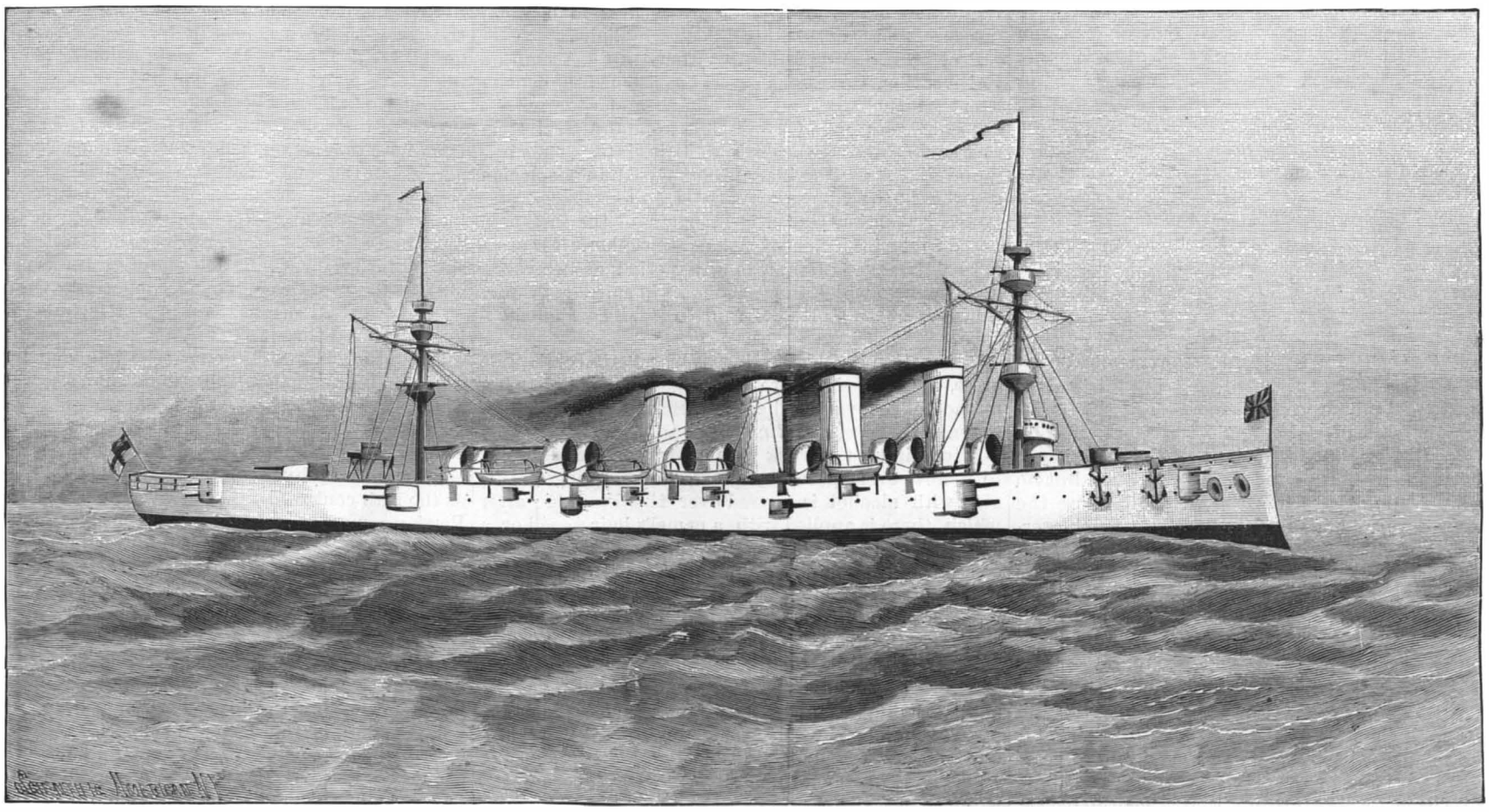
The light, which is run up and down on rails in the plane of the structure, is housed by day. At night it is hoisted to its place at the apex of the triangle by machinery worked in the oil house at the base of the structure. The large foundation plates are about 40 feet apart. The focal plane of the light is 120 feet above the sea level, but the top of the structure is 132 feet from the ground. The cost of the iron work set up is $9,400 and that of the structure complete and lighted about $12,000.

THE HIGH BRIDGE OVER THE NORTH SEA CANAL NEAR LEVENSAU.

The German princes and representatives of all the civilized nations of the world will soon meet to witness the opening of the great North Sea Canal, by which the voyages of vessels plying between the Baltic and North Seas will be shortened by three days and at the same time they will be enabled to avoid the dangers of the Danish coast.

One of the most important works in the construction of this canal is the high bridge near Levensau, which has just been finished. It was built by the Gutehoffungshutte in Oberhausen-Sterkrade to make a crossing for the Kiel-Flensburg Railroad on the one hand, and for the macadamized road from Kiel to Eckernforde on the other hand. This masterpiece of engineering has the longest span (541 feet) of any bridge on the Continent; the highest point of its span is 137 feet 9 inches above the surface of the water in the canal, and the floor of the bridge is 33 feet 5 inches wide, 26 feet 10 inches of which is devoted to the railroad track and the carriage way, the rest being used as a promenade.

The total weight of the structure is 3,000 tons, and it was built by the Gutehoffungshutte (Good Hope Iron Works) in fifteen months, a remarkably short time for such a piece of work. The iron frame was set up between May and October, but this could never have been done without the perfect machinery at the command of the company. The immense iron parts were raised directly from the vessels by means of cranes driven by electricity, and in placing them other hoisting devices were used which were also driven by electricity. In the bridge proper there are half a million rivets, and 50,000 lb. of red lead and paint were used in painting the iron work. The scaffolding contained 2,616 cu. yd. of wood, 49,212 lineal yards of framing timbers, 330,000 lb. of iron beams. It should be stated that the work has been successfully completed without any serious accident to any of the workmen.—Illustrirte Zeitung.



H. M. SHIP TERRIBLE.

THE big landing stage built in the Mersey by the Liverpool Dock Board does away with the use of tenders, and the steamship passengers enter directly the trains of the Great Northern Railroad. The necessity for crossing the city in stage coaches is avoided.

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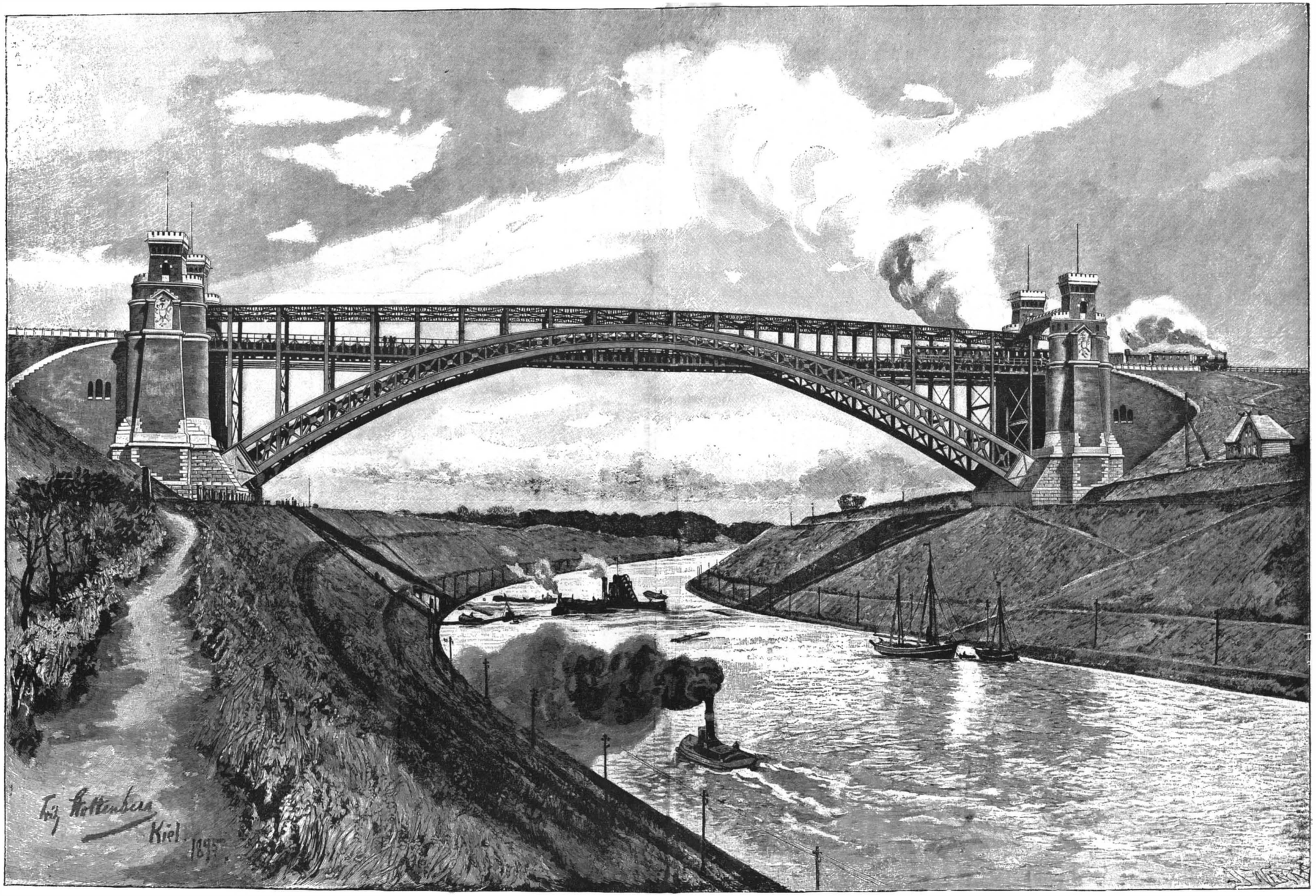

HIGH BRIDGE OVER THE NORTH SEA CANAL AT LEVENSAU.

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English Criticism of American Railroads.

In a paper read recently before the Cleveland Institution of Engineers, England, Mr. Jeremiah Head, of the Society of Civil Engineers, compared the methods of construction, maintenance and operation of English and American railroads. The paper was prepared after two long and careful railroad pilgrimages through this country and careful and unprejudiced study of the subject in hand.

The author looks with favor upon the American drawing room, dining and sleeping car; he approves of the American bogie trucks (principally because he considers them better adapted to our less perfect roads), and he prefers the flat-bottomed American rail, but there are seven points where he insists that England excels America. These are summarized by Mr. Head as follows:

"Among the directions in which we may congratulate ourselves on still keeping ahead of American practice, the following are the most conspicuous, viz.:

"1st. We operate our railways more cheaply than they do, we requiring 56·6 per cent and they 70·4 per cent of the gross earnings for that purpose.

"2d. The net earnings of our railways are over four times as much per mile of line, and over three times as much per mile of single track as those of the States.

"3d. The average return on capital employed is in our case from 20 to 28 per cent more than in theirs, notwithstanding our far more profuse expenditure in construction and operation.

"4th. Users of our railways have the option of three times as many trains as have the Americans.

"5th. Trains in England travel at a much higher speed on the average than they do in the States or in any other country.

"6th. The railway passenger here runs less risk of accident than there, in the proportion of 1 to about 4·5, notwithstanding the higher speed at which he travels, and he is conveyed, if he is content with ordinary accommodation, at a lower rate per mile.

"7th. He has almost everywhere better station accommodation, and better facilities for getting himself and his baggage from stations to his destination."

Antimony and Bismuth in Bolivia.

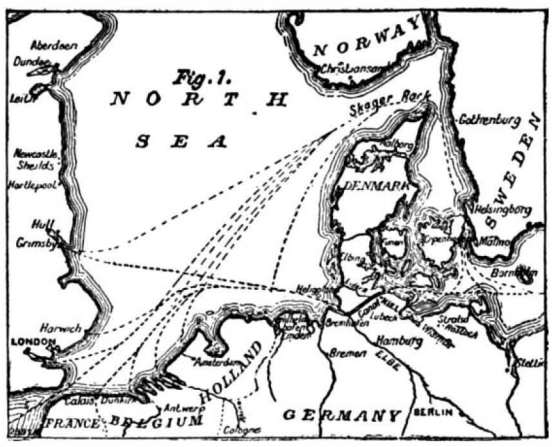
The consul-general of France at La Paz, in Bolivia, has recently made a special report on the mines of bismuth and antimony in that country. The only deposit of bismuth ore actually known is that of Quechisla (also known as Chorolque), though some exploration for others has been made, but without success. The returns show that the production of this mine is about 500 Spanish quintals, or 23,000 kilogs., per month. This production, however, is regulated in concert with the European producers. In addition to bismuth, the Quechisla mine yields some tin and a little silver. Antimony is found in many places in the department of Potosi, generally in connection with gold and silver ores. In the province of Chayantla there are many veins of the sulphuret of antimony, which have become more accessible than formerly since the building of the Antofagasta Railroad. Owing to the present low price of the metal, however, it does not pay to work the poorer deposits. The Amayapampa Company, a recently formed Bolivian corporation, is now producing and exporting 100 metric tons a month of 65 per cent ore. The mine is eighteen miles from the railroad, over a difficult mountain trail. With better transportation the output could be largely increased. It is said, however, that all the veins so far found diminish in richness with depth. The industry is just beginning in Bolivia, and the government has freed the producers from all direct tax and also from export duty.

The Salt Water Filter.

It has been stated by the Revue Scientifique that Mr. Pfister, an Austrian engineer, has discovered a curious property of the trunks of trees, that of retaining the salt of sea water that has filtered through the trunk in the direction of the fibers. Mr. Pfister utilizes this property for obtaining potable water for the use of ships' crews. The apparatus, which has been patented, consists of a pump which draws up the sea water into a reservoir, and then forces it into the filter formed by the tree trunk. As soon as the pressure reaches from thirty to forty pounds per square inch, the water is seen at the end of from one to three minutes, according to the kind of wood used, to make its exit from the other extremity of the trunk—at first in drops, and then in fine streams. The water thus filtered is potable, having been freed from every particle of saline taste. The tree trunk measures fifteen feet in length by from five to six inches in diameter.

THE OPENING OF THE NORTH SEA CANAL.

One of the most important engineering works of the nineteenth century will be inaugurated June 20, when the Baltic and North Sea canal, which cuts across the base of the peninsula formed by Jutland



and Schleswig-Holstein, will formally be declared open to the commerce of the world.

Eight years have now passed since Emperor William I laid the foundation stone of the Holtenau lock, near Kiel, on June 3, 1887. Now his grandson will open the canal with imposing ceremonies. It will be the occasion of a naval pageant which has never been equaled. From eighty to one hundred war vessels, representing the principal navies of the world, will be present. Germany leads with about forty vessels, then England with ten war ships, followed by Italy, Russia, the United States and Austria in order of their strength. The United States will be represented by four ships, the Columbia, the New York, the Marblehead and the San Francisco. The United States fleet is under the command of Admiral Kirkland.

The Hamburg banquet will be held on the evening of June 19. The international fleet will pass through the canal from the western end on June 20. In the afternoon the Emperor will give a reception on board the royal yacht Hohenzollern. In the evening there will be a grand ball at the naval academy at Kiel. On the 22d there will be a naval parade followed by a grand banquet in the evening. The United States fleet will be brilliantly illuminated by thousands of electric lights and special fireworks.

The completion of the canal is of far-reaching importance to Germany, Russia and Denmark. Thirty-five thousand vessels now annually pass around the peninsula, representing 20,000,000 tons. The chief value of the canal will consist in saving mariners from the perilous voyage around Denmark, whose rocky channels and reefs taken in connection with the storms and ice floes have been a constant source of danger for centuries. Nearly three thousand vessels have been wrecked and three thousand five hundred more seriously injured since 1858 off this wild coast. For large ships the coast is regarded as one of the most dangerous spots in Europe. The new waterway will permit vessels of ten thousand tons register to pass through. The canal is 61 miles long, 200 feet wide at the surface, and 85 feet wide at the bottom. The estimated cost is $39,400,000; of this sum, Prussia contributed $12,500,000. The work has been pushed with great energy. At times as many as eight thousand six hundred men were working at once. The strategic value of the canal to Germany cannot be overestimated, as her vessels will no longer have to pass through foreign waters. The city of Kiel will be of paramount importance in case of war, as it has a magnificent harbor and is already the most important naval station on the Baltic. The average time of transit through the canal will be 12 hours.

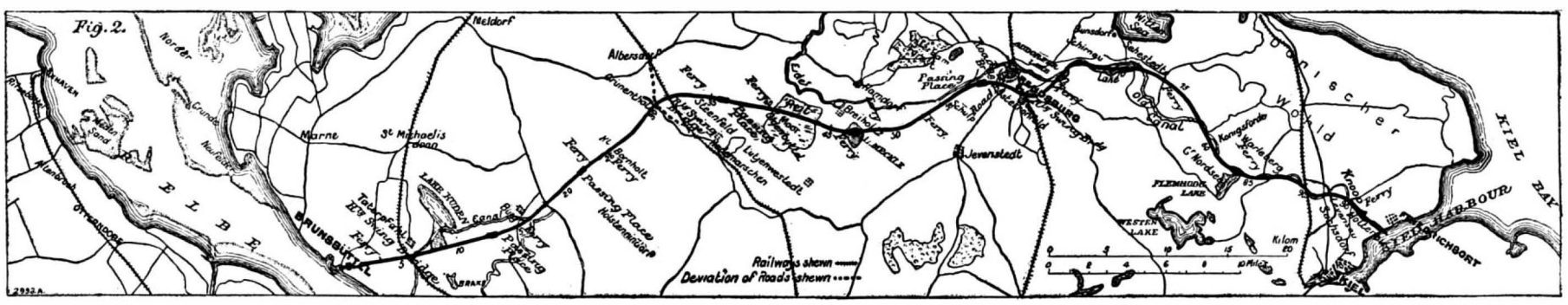
The maps we herewith present will convey an idea of the position and course of the new canal.

Electricity and Prestidigitation.

The powerful aid which modern magicians are able to derive from the subtile electric current, says the Electrical Engineer, London, is common knowledge, and little wonder is there consequently that from time to time these wizards startle the wonder-loving world with new and striking developments in their "black art." One of the latest efforts in this direction is that of M. Trouve, who, through the intermediary of the prestidigitator Roskoff, utilizes the telephone in the production of that interesting attribute known as double vue, or second sight. The medium, whose task, as we know, is to describe for the benefit of the audience unseen objects selected by them, receives, by the Trouve method, the necessary information by means of two very sensitive auricular telephones. These instruments—the size of a two-franc piece and from 8 to 10 millimeters thick—consist of a small metallic box, in which there is a tiny electromagnet, while the lid of the receptacle represents the diaphragm. The conductors form, in the first place, a flexible semicircle, which keeps the telephones in proximity to the ear, and they are then continued down the body, hidden in the clothing, and out by the soles of the shoes to the carpet, under which the connections are secretly disposed. The receivers and the wire semicircle are concealed by a wig which the medium should wear, together with a costume in keeping with this hirsute adornment. The public will never suspect the existence of electrical apparatus, but as an additional precaution connections should be placed at various points in the room, and the subject, blindfolded and with his back to the audience, installed successively at each of them, the telephones being connected with a battery and a microphone fixed "behind the scenes." The articles which he has to describe are then so placed on a table that a confederate at the hidden transmitter may easily see them by peering through a small orifice, and thus communicate to the medium in a low voice the necessary particulars, which he repeats for the edification and to the no little astonishment of his auditors.

The St. Sophia Mosaics.

The mosaics in the church of St. Sophia at Constantinople are of glass set in a plaster or cement made of lime and marble dust in the proportions of one to two respectively. The brick and stone walls and dome of the church were first made rough with mortar over which a strong, fine plaster nearly an inch thick was laid. Upon this the cartoons were sketched in. The artist began by selecting some important part of a picture—such as a face—and, knocking out a part of the plaster, laid in a few pieces of mosaic at a time, pressing them flush with the surface and fixing them with his lime and marble cement. After the more important portions were finished, the draperies, backgrounds, etc., were done by the artist's assistants. The mosaics in the dome and elsewhere, that are always seen at an angle exceeding forty-five degrees, are peculiarly set. The pieces are arranged with their upper edges set forward from the surface, and are placed in tiers at a considerable distance apart, though from the point of view they appear to be close together. In this way much labor, material and expense are spared. In some cases as much as two-thirds of the actual surface is bare. The method has the artistic advantage of reflecting the light at a better angle.



MAP OF THE NORTH SEA CANAL.

The Cape Cod Canal.

Mr. Benjamin J. Berry, one of the incorporators of the Cape Cod Ship Canal bill, which became a law June 4 and who has been for ten years endeavoring to secure the passage of such a bill, said in an interview that the corporators, all of whom are Massachusetts men, are prepared to begin at once the work of construction at Bass River, between the towns of Yarmouth and Dennis. They feel sure of success, and say that in two years ships will be passing through the canal. The work is expected to cost from $5,000,000 to $8,000,000.

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Leafless Trees.

As a rule, every species of tree has characteristics exclusively its own, and one in love with the subject can distinguish a species as well by the bark or system of branching as by flowers or fruit. Almost any species of oak can be named by the close observer as well by its system of branching as by its acorns. Indeed, some can decide a species better this way than by any other. The willow oak, for instance, has numerous twiggy branches, in this respect rivaling the beech; but the upright character of the growth is the opposite of the beech. The pin oak can always be positively decided upon by the tendency of the lower branches to decline straight from the junction with the stem, and not curving down as others would. The black oak always has its branches diverging at a flattish angle, while its neighbor, the scarlet oak, takes a more acute line.

The chestnut oak has a tendency to branch low, as in the white oak; but the branching is very irregular. One of the most beautiful, if a gradual regularity on a fixed plane be taken into consideration, is the swamp white oak. A master in the art of pruning could not produce a more beautifully regular tree than nature hands over to us in a good specimen of this one.

It is extremely difficult for the botanist, accustomed merely to look to leaves and acorns, to tell some forms of the swamp white oak from forms of the mossy cup oak, but the winter habit of the trees never leads one astray.

Then, the general characteristics of trees furnish a grand study when in the bare and leafless state. The fond observer can easily tell a beech from a linden, an oak from an ash, and so on throughout the whole line. No two families of plants have trees of like aspects. This is particularly true of specimens that have had a chance to stand out by themselves, so as to show just what character nature intended they should bear.

In planting, all this should be borne in mind. Some trees must be set out for the cool, summer shades they give, others to protect us from winter storms. Often when this has been secured there is not much room for other trees. But wherever practicable, room should be kept for a few, at least one, to grow up without interference from other trees. It will be a great pleasure to watch it, when leafless every year, as it grows, and when it reaches maturer years, it will furnish a beauty which the eye will never tire of feasting on. The writer has, in view of his library window, a specimen of the Colchian maple, some forty years old, which in summer presents merely a shapely mass of green foliage not much differing from the Norway maple. But to see it in winter is altogether another thing. One may sit by the hour and never tire of scanning it, and on every new observation new beauties appear.

These leafless trees give an interest to winter that summer can scarcely supply, and every lover of a garden will do well to study this lovely branch of the delightful art.—Meehan's Monthly.

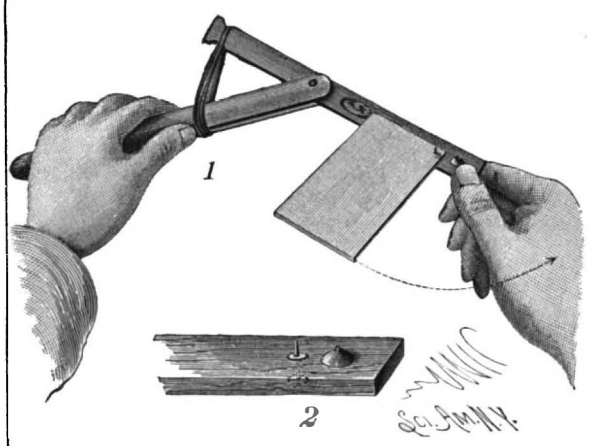
Coal Production of the World.

According to the latest reports upon the coal industry, England is the largest producer in the world, her output during 1894 having been 188,277,525 tons. This was mined by 705,244 persons. The United States comes second in the list with 164,000,000 tons. Germany produced during the same year about 73,000,000 tons, exclusive of lignite. The other coal-producing countries mine practically the same amount from year to year, as follows: Austria-Hungary, 10,700,000 tons; France and Russia. 6,250,000 tons each; Australasia, 4,000,000; Japan, 3,250,000; Nova Scotia, 2,250,000; Spain, 1,300,000; British Columbia, 1,200,000; Italy, 300,000; Sweden, 200,000.

The consumption of coal per head of population is lowest in Austria, where it is only one-sixth ton per annum, and highest in Great Britain, where each person averages three and three-tenths tons each year. In the United States the average is two and one-fourth tons a year.

THE CARD SKIMMER.

The simple toy illustrated here can send a card whirling like a boomerang to a height of fifty to a hundred feet. Its construction is simple but very ingenious. The general make up is shown in Fig. 1. A slotted handle receives a pivoted slip of wood. Around the handle and notched inner end of the slip a strong rubber band is sprung. If the slip is drawn out of position as shown in Fig. 1, and released, the rubber band jerks it violently back. On the end of the slip is a short sharp pin and a slight cone, shown in Fig. 2.



THE CARD SKIMMER.

In use the card is stuck on the pin point, the pivoted piece is drawn back as shown in Fig. 1, and released. It springs forward, carrying the card with it. As soon as it is in line with the handle, or just passes such position, its motion is arrested by the band. The card then swings around on the pin point, its edge mounts up the side of the cone as it does so and is lifted off the point and flies whirling through the air to an astonishing distance. For band an umbrella ring may be used. Excellent effects are got by using little boomerangs instead of square cards.

MACHINE FOR SHARPENING CUTLERY.

The French machine for sharpening cutlery which we illustrate consists of a heavy base to which are secured two channeled rails which carry a small truck, to which a large beveled wheel is fastened. The shaft on which the wheel is secured is extended on one side, to which a handle is fastened. A small gear wheel is mounted between the handle and bevel wheel and engages with a rack which is attached to one of the channeled rails, so that, when the truck is run back and forth, motion is imparted to the large bevel wheel and by it to the small emery wheels, which are secured to the frame of the truck. These emery wheels are adjustable by means of screws provided with milled heads. The razor, or other article of cutlery, is secured in an adjustable support, the emery wheels are turned down so that they are in contact with the blade. The truck or carriage is then run backward and forward by means of the handle; motion is thereby imparted to the bevel wheel, and by it to the emery wheels.

The motion of the emery wheel is one of rotation and translation as well, so that the entire length of the blade is ground. When scissors are to be ground, one of the emery wheels, with its support, is removed. For our engravings we are indebted to the Revue Universelle.

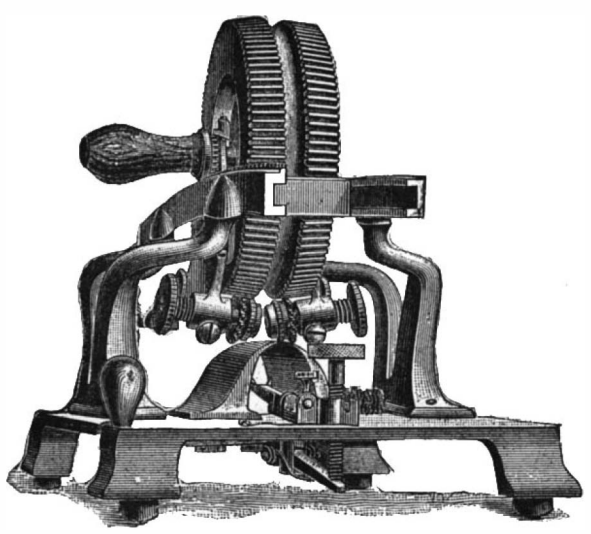


Fig. 1.—MACHINE FOR GRINDING RAZORS—END VIEW.

Water Power.

At a recent meeting of the Boston Scientific Society the speaker was Mr. Allan V. Garratt, his subject being "Some Problems in the Use of Water Power as Applied to the Electrical Transmission of Power."

As reported in the Boston Commonwealth, Mr. Garratt prefaced his paper by calling attention to some of the laws of hydraulics. Many people suppose that the power of a waterfall, for instance Niagara, is in proportion to the volume of water flowing over the fall, whereas it is in proportion to the height from which it falls, or its head; so that a comparatively small volume of water falling from a great height would give as much power as a larger volume falling from a less altitude. The speaker illustrated these facts on the blackboard by mathematical formulæ.

Descriptions were given of several of the more important waterfalls in the United States, which are being utilized for the generation of electrical power, notably Rainbow Fall, on the Missouri River, at Great Falls, Montana. This fall is capable of producing two hundred thousand horse power, of which about one per cent is at present used. The height is forty feet.

Among others were the falls at Ouray, Col., seventy-five feet high, and the Lower Falls of the Yellowstone, capable of generating from two to three hundred thousand horse power. These are not yet developed. An artificial fall in Nebraska was also described. In this case the natural fall of the river was about seven feet per mile. A canal was constructed, carrying the water about one mile and over a segmental dam, giving a fall of about sixty feet. A very complete description was given of a large plant at Baltic, Conn., which furnishes power to run a large textile mill, an electric street railway and an electric freight locomotive.

The chief problem in the conversion of water power into electrical power is that of regulating the flow of the water through the turbine wheels. The water is led from above the fall by pipes, sometimes twelve inches in diameter, to turbine wheels which in their turn operate electrical generators.

On account of the constant variations in the load on the machinery, it is necessary to have some means of regulating the flow of water automatically. One way of doing this was to have a man to regulate the flow by opening or closing the gates. This is, of course, impossible in a plant of any considerable size. Another contrivance employed a ball governor which automatically opened or closed the gates. This was a failure, because of the well known laws of inertia, and had a great tendency to race. Mr. Garratt described a very ingenious regulator whereby the gates were made to open or close, a little before the governor reached its highest or lowest point, thus obviating the chief defect of the older machine.

Antiquity of the Harp.

Mr. W. S. Macdonald, of Glasgow, in a recent lecture before the Highland Society of London, traced the history of the harp from the shadows of mythology to the present day. It is, he said, the first musical instrument on record and was the principal one of ancient and medieval times. All the skill and artistic genius of the Egyptians was lavished upon its design and decoration. The Druids first brought the tone and pitch of the harp to perfection. It attained the height of its favor in modern times in 1810, when Sebastian Erard, of London, brought it to the front rank of musical instruments. It has been inseparably connected with the traditions and lore of the Gaelic people from time immemorial.

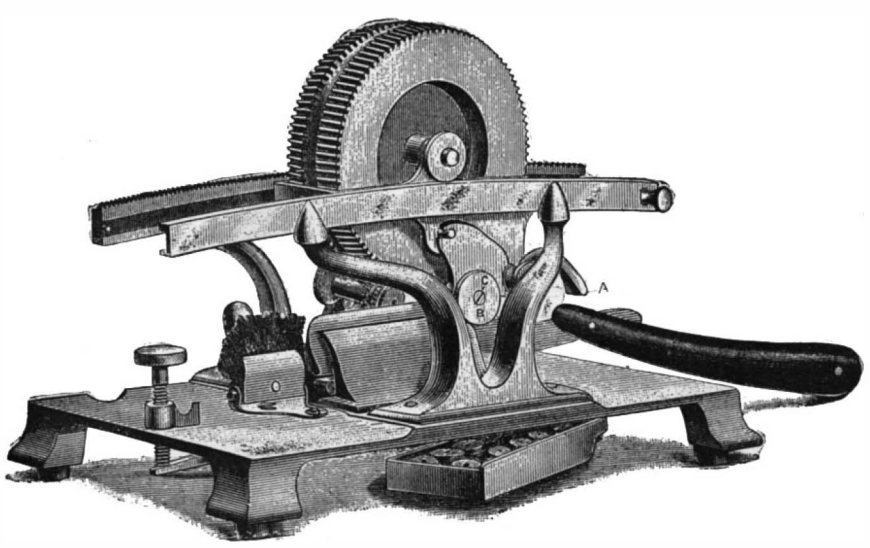


Fig. 2.—MACHINE FOR GRINDING RAZORS—SIDE VIEW.

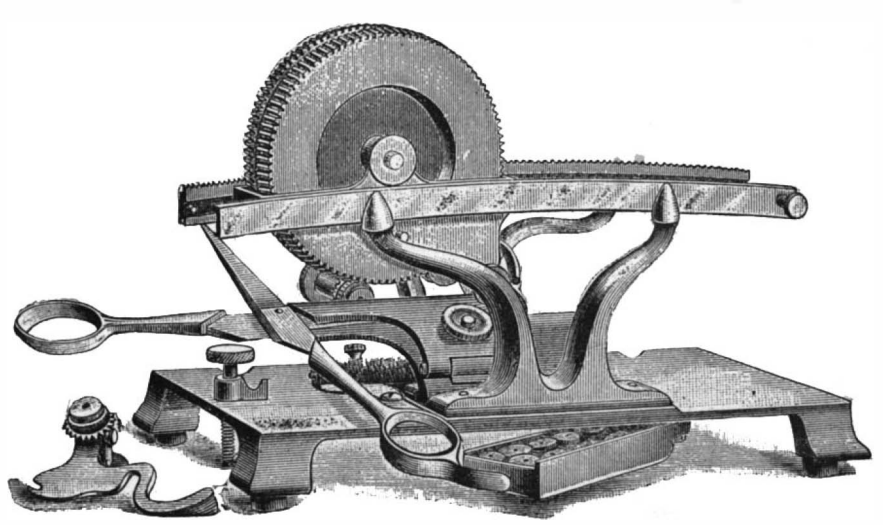


Fig. 3.—THE MACHINE ARRANGED FOR SHARPENING SCISSORS.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CLOSED CONDUIT ELECTRIC RAILWAY.—Michael F. Flynn, Stamford, Conn. According to this improvement the live wires, both supply and return, are held in a closed conduit, in combination with a contact rail which a trolley on the car may easily follow, and a very simple automatic switch mechanism, by which the current is only supplied to that part of the contact rail immediately beneath the car, contributing to the safety of the line and preventing loss of current. As the car advances, a simple mechanism carried by the trolley successively closes and opens the switches to the supply wire. Means are also provided for keeping the line clean, and, altogether, to afford an efficient system which may be economically operated.

CAR AXLE BOX DUST GUARD AND OIL SAVER.—Frederic P. Thompson, Fredericton, Canada. This improvement comprises a dust guard or collar in which two concave bearing edges are held against the top and bottom surfaces of the axle and are pressed together by means of springs, causing them to tightly close about the axle and advance to a close fit as fast as they wear, maintaining always a tight joint. The invention provides a cheap and simple construction and arrangement of parts, very convenient and effective in use.

SELF-OILING WHEEL.—Ebenezer S. Jennings, Pomeroy, Ohio. Car and other wheels, according to this improvement, have an oil chamber surrounding the bearing sleeve, and the sleeve is slotted to supply the oil to the journal throughout its entire length, inlets being arranged to permit the easy entrance of the oil, but preventing its waste. The construction is such as to obviate the necessity of using a cap to close the reservoir or oil chamber.

Mechanical.

MACHINE FOR TWISTING METAL STRIPS.—Thomas M. Polyblank, New York City. This is a machine in which one or a number of bends may be made in a metal strip or a length of wire, and simultaneously with the bending an aperture may be produced in the bent portion, the strips being so bent in sections that when a series of them are crossed a lattice will be produced, the strips being joined by bolts or rivets passed through registering apertures. The sections of the strips with apertures and the blank sections may be of any desired length, and the apertures be made to center metal of various widths, adjustable guides or shoes being employed to maintain the strip in position to be operated upon.

PUMP VALVE.—James Hewitt, Brooklyn, N. Y. This is an improvement in manufacture by which the valve is made with a metallic upper face and a lower or seating face of rubber, fiber, or similar material, more or less yielding. It is designed to combine the two materials in such manner that they may be united at a single operation, and when united the seating surface will be securely attached to the back without the aid of cement or other fastener.

WIRE FEEDING DEVICE.—Otto J. Ebert, Beaver Falls, Pa. In machines for making wire nails, staples, and similar articles, this invention provides a simple device to insure the positive and uniform feeding of one or more wires to facilitate the work of the machine. The improvement consists principally of a spring-pressed pivoted arm carrying at its free end a grooved wheel engaging the wire to be fed, a guide being arranged opposite the wheel to enable the wire to be clamped between the guide and the wheel.

Miscellaneous.

SPEED INDICATOR FOR BICYCLES.—Andre Noel, Paris, France. This is a device which may be conveniently mounted on and driven by the bicycle, to indicate at all times the speed at which the wheel is moving. A dial graduated to indicate units or distances is arranged in a casing attached to the frame near the handle bar, and the dial is traversed by an index hand connected with a screw stem which is rotated by means of steam-governor-like connection within the casing with a shaft rotated from the front wheel or axle. As the weights on the governor arms within the casing are thrown out to a greater or less extent, when the wheel is being propelled, the index hand is correspondingly moved over the graduations on the dial.

FLOUR MILL SHAKING BOLT.—Harry K. Mowson and Roswell F. Corey, Scottsville, N. Y. This invention combines a scalper with a grader, to properly and rapidly bolt large quantities of break chop, middlings, and flour without danger of clogging. The sieve is so hung that by means of eccentric rods and rocking beams, an up and down motion is given to its upper end, while a longitudinal motion is also given to it, the double motion agitating the material passing over the sieve, whose meshes are cleaned by rotating brushes mounted to travel under its perforated bottom.

BLEACHING GLUE.—John E. Kunitz, Santa Cruz, Cal. A process has been patented by this inventor to bleach fresh cut glue by subjecting it to the action of sulphur fumes, rendering the dried glue more soluble and serving to preserve it longer in the carpenter's pot, as destroying bad odors if it is made of impure material. The process consists in mixing with the liquid glue subacetate of lead, cooling and spreading the fresh cut glue on perforated supports, and then sulphurizing it. In this manner impure glues may be given a milk-white shade quickly and inexpensively.

FOLDING SCREEN.—John T. Loveland and George W. Eastburn, Sheldon, Ill. To securely unite several screen panels so that they may be conveniently folded up or extended, the screen is provided with a hinge having a split ring forming an eye adapted to engage a bearing on one of the panels, its end portions forming parallel adjacent prongs for insertion in the end of one of the rods of an adjacent panel. A hanger adapted to support a curtain or filling rod has a cap engaging the end of the rod wherein the prongs are inserted, the cap being centrally perforated for the passage of the prongs.

GATE.—William B. Atkinson, Bowling Green, Ky. This invention provides an improvement in automatically operated gates opening in a direction opposite from that of a person approaching. A hinge post extending above the gate supports a main lever, and when this lever is swung from normal position, to one side or the other, its movement first releases the latch and swings the gate open, the latches on the gate, when the latter is fully open, engaging catches on posts at the roadside. The main lever is operated by pulling on cords suspended from suitable supports at each side of the approach.

INKSTAND LID CLOSING ATTACHMENT.—Theodore L. Harlow, Gardner, Mass. This is a simple device of silvered wire adapted to clasp upon the body of the inkstand and afford hinged support to a lid for the ink well, the lid being automatically lifted from a closed position by contact of the penholder with a rocking frame that is part of the device. The lid afterward closes by gravity, remaining elevated only a fraction of time, sufficient to allow the pen to be removed without obstruction or contact with moving parts, the ink well being at no time left open. The device can be made cheaply or elaborately. It was invented by an accountant of over thirty years' experience, and was the result of experiments made on account of the annoyance he had experienced from dust and lint becoming mixed with his ink, as well as the fact of the ink thickening after exposure.

LIQUID SAMPLING DEVICE.—Gaetano Tagliabue, New York City. To obtain samples of liquid from different parts of a containing tank, and especially for getting oil samples from an oil tank, this inventor provides a device consisting of a barrel having a gravity valve at each end, a stem extending from the lower valve to within a short distance of the upper valve, there being means for independently raising the latter valve, while a rod secured to the lower valve is made up of sections of different lengths. By proper adjustment before the barrel is dropped into an oil tank, the valves are lifted at the desired distance from the bottom, and close automatically when the barrel is raised from the tank.

WALL AND FURNITURE GUARD.—George W. Hinkle, New York City. This is a roller attachment having a screw shank by means of which it may be conveniently applied to any article of furniture without the use of tools, and adjusted so that the axle of the roller may be vertical or at any desired angle. The guard is applied to that part of a piece of furniture which is most likely to come into contact with the wall, protecting both the wall and the furniture, without disfiguring the latter.

SERIES PHOTOGRAPHIC CAMERA.—Robert D. Gray, New York City. For taking a series of pictures of moving objects and projecting the pictures on a screen with the aid of a suitable illuminant and light-controlling devices attached to the camera, this inventor has devised an apparatus whereby all the movements of the object are represented in the pictures when projected. Guides hold a strip of unexposed sensitive film in two focal planes at right angles to each other, and a plane segmental revolving mirror arranged on a plane at an angle of forty-five degrees with the axle line of the objective is constructed to eclipse the direct light beam entering the camera and at the same time reflect it laterally to the portion of the sensitive film lying parallel with the axial line of the lens. There are also devices for moving two portions of the film in alternation along the two focal planes by a step-by-step movement.

BARREL HEAD.—George M. Burroughs and Frank K. Roberts, Santa Cruz, Cal. This is a sectional head having parallel recesses in which are arranged slidable rack bars having rubber tips. The head may be readily adjusted at any desired height in the barrel and fastened there by turning a hand wheel on a shaft on which is a cog wheel whose teeth mesh with those of the sliding rack bars, the shaft being mounted in a bracket secured to the top of the head.

SIGN.—George C. Humphries, Brooklyn, N. Y. This is a step sign having a body plate adapted to carry the house number, and an angled fastening device, a horizontal member of which is adapted to be driven between a step and the riser of the next step, while a vertical member engages the outer face of the sign plate. A means is thus provided of readily making visible a house number without depending on that usually placed on the transom or on or over the door.

DISPLAY FRONT FOR BOXES.—Edward L. Chaffin, Helena, Ark. In show fronts of boxes, especially those designed for crackers, dried fruits, etc., this inventor has devised a construction with which the front may be divided into two sections, the upper section being a drop section which has end guards, so that when the section is dropped downward to expose the contents of the box they will not spill out at the ends. An automatically operating fastening or locking device is also provided for the drop section, and the entire front is so made that it may be secured to any style of box or receptacle.

COIN SLOT LIQUID DISPENSING APPARATUS.—Pierre A. Juge, Thibodeaux, La. In applying this apparatus to a keg, a faucet barrel is first driven into the keg after the manner of driving beer faucets, and a box-like casing is then placed in position over and around the barrel, a projecting lever connected with the faucet being so arranged that the faucet can only be operated by the lever to discharge a given measure of beer or other liquid on the placing of the proper coin in the slot or trough of the apparatus. The device may be readily attached to a keg of beer, ale, or other liquid, or to a tank or reservoir.

BOTTLE STOPPER AND FEED.—William S. Swan, Maumee, Ohio. A device for use on ink bottles and ink stands, to prevent the ink from evaporating and becoming thick, while permitting of conveniently supplying the pen with ink, has been devised by this inventor. The tubular stopper has an air chamber over which is an elastic diaphragm, there being a sleeve of hard material within the tube and a depressible funnel over the diaphragm, while a funnel tube extends from the funnel through the diaphragm and the central opening of the sleeve, the funnel tube having an enlarged upper portion engaging the upper end of the sleeve when the funnel is depressed. The device is cheaply made and may be readily applied to any kind of ink well.

POCKET HOLDER FOR PENS, PENCILS, ETC.—Walter S. Russell, Cooperstown, N. Y. This is a device adapted for application to a vest pocket, stretching the pocket laterally but without bulging it or detracting from the appearance of the garment, while affording an absolutely secure hold upon pencils, fountain pens, etc., placed in the pocket. It consists of two plates of spring material sliding upon one another, and which may be locked in adjusted position, both plates having spurs at their end portions, while an elastic band surrounds the plate sections, passing between the spurs.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE MODERN MACHINIST. A practical treatise on modern machine shop methods. By John T. Usher. New York: Norman W. Henley & Company. 1895. Pp. xxxv, 322. Price $2.50.

The title of this book is sufficient justification for its existence. The modern machinist, in the personal sense, must be a student of the literature of his profession. The rule of thumb and empiric practice can no longer be tolerated in the machine shop of the day, and the man who wishes to progress beyond the mere status of workman must study. The present work is devoted in its text to modern machine shop methods and in its pages may be found treated such subjects as Measuring Instruments, Vise Work, Chasing, the Erection of Machinery, Planing, Shaping, Slotting, Milling, Lathe Work, and other topics, all treated in great detail and with very numerous illustrations. The illustrations for the work were prepared especially for it, so that in it we notice a pleasing feature in the absence of the old time cuts, with which we all are too familiar. The illustrations are new and fresh and thoroughly appropriate for the subjects treated. A machinist's manual must be rewritten every few years; the present one, in its first edition, and written by one of the best known machinists of the day, will appear thoroughly up to date and will be found to be one of the most modern exponents of the science, and all its subjects will be found to be treated up to latest developments. Two of the most commendable features of the work are the index and the table of contents, both of which deserve very high praise on account of their thoroughness.

ELECTRICAL ENGINEERS' AND STUDENTS' CHART AND HAND BOOK OF THE BRUSH ARC LIGHT SYSTEM. By H. C. Reagan, Jr. New York: Norman W. Henley & Company. 1895. Pp. 48. Price $1.

One who has studied and understood thoroughly any single dynamo is in excellent condition to study others. The Brush dynamo, the leading example of the open circuit type, in its theory and history has been one of the most interesting developments of electrical engineering. The present work receives its best praise when we state that it explains to the comprehension of all the action of this machine, and that the very numerous illustrations in the text are thoroughly appropriate and apposite. In addition to these illustrations, however, the author supplies us with a species of working model or movable diagram in pasteboard and celluloid, which illustrates the exact relation of the commutators to the coils and brushes and of the whole to the lights, which, with the many diagrams, will make the subject exceedingly clear. To the student of electric lighting the book must be commended, while to him who has to deal with the Brush system it will be found a sine qua non.

VARIED OCCUPATIONS IN WEAVING. By Louisa Walker. London and New York: Macmillan & Company. 1895. Pp. xviii, 224. Price $1.

This book is meant for the use of schools, and shows samples of varied articles made by weaving processes, some exceedingly pretty. The illustrations are very numerous, so that whatever is shown may be done, as it is very clearly explained. We believe that for work at home it will be found very useful and productive of ideas which can be utilized in the manufacture of Christmas presents and the like. The aim of the author is to use the "Froebel gifts" as the basis of all teaching, and when possible to apply the same excellent methods to other work of everyday usefulness. As a book for little workers, it may be considered one which will help in attaining satisfactory results by simple methods.

MOTIVE POWERS AND THEIR PRACTICAL SELECTION. By Reginald Bolton. New York and London: Longmans, Green & Company. 1895. Pp. x, 257. Price $2.25.

This excellent little work covers manual, animal, wind, water and steam power, as well as gas and hot air engines and electric storage batteries. It will be seen that quite a large field is covered by it, and there is no doubt that the author, with so little space at his disposal, has done very well. It does, however, seem as if the field was rather too large to be embraced in so small a work.

AROUND THE LAKES. Containing a list of American lake vessels, and addresses of managing owners, condensed statistics of the lake business, and a historical resume and illustrations of the plant and vessels built by the Detroit Dry Dock Company, Detroit, Mich., Ship and Engine Builders. Pp. 228.

Although this book is a catalogue or advertising circular of a specific business, it is a most interesting contribution to the subject of naval engineering as regards the phase of it carried on upon the great lakes. The title page, which we have given in full, acts as the best synopsis of the contents. The book is very fully illustrated with reproductions from photographs and with engravings showing different lake vessels. It contains also many statistics and examples of repairs to injured ships. It is not restricted to steam vessels. It is quite interesting to look through it and see how the fresh water navigators have worked out a scheme of freightage different from that employed on the ocean. It is observed that the vessels are classified into package freight steamers and coarse freight steamers, besides the sailing vessels and passenger classification. As a sample of old time work, the three-masted schooner Michigan, built in 1874 and carrying upward of one thousand tons, is referred to and is shown in a very spirited cut.

THE UNIVERSITY TUTORIAL SERIES. An elementary text book of hydrostatics. By William Briggs and C. H. Bryan. London: W. B. Clive. University Correspondence College Press. Pp. viii, 208. Price 80 cents.

Those who are content to follow the English syllabus, the London University matriculation standard, and things of that sort as their limit in scientific study can find in this little work a useful manual, and even those who propose to go beyond the ground so sharply marked by our English friends will find in the numerous problems of this work an excellent opportunity for practice. The work is excellently made up, its type and paper being most satisfactory.

JOHN DALTON AND THE RISE OF MODERN CHEMISTRY. By Sir Henry E. Roscoe. New York and London: Macmillan & Company. 1895. Pp. 212. Price $1.25.

This work is a charming little review of the life of the grand old Quaker, who, by his genius, lifted himself to the heights of undying renown. His personal characteristics are most amusingly brought out. Principal of his own school when twelve years old, and teaching boys and girls ranging from infancy to the age of sixteen or seventeen, he certainly was a phenomenon, and the book throughout bears out the interesting impression made by the early life of the great investigator. We would be inclined to put this book side by side with the admirable "Life of Clerk Maxwell," as a contribution to the personal side of the history of science. A very full index adds to its value.

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SCIENTIFIC AMERICAN BUILDING EDITION.

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1. A cottage at Bronxwood Park, Williamsbridge, N. Y., recently erected for Dr. Geo. P. Shirmer, at a cost of about $2,500. Perspective elevation and floor plans. A pleasing design. A. F. Leicht, Esq., architect, New York City.
2. An elegant plate in colors showing a cottage at Bronxwood Park, Williamsbridge, N. Y., recently erected at a cost of $2,200. Perspective view and floor plans. Mr. A. F. Leicht, architect, New York City. A neat design.
3. A cottage at Flatbush, L. I., recently erected for W. K. Clarkson, Esq., at a cost of $5,000. Perspective elevation and floor plans. Mr. Christopher Myers, architect, New York City. A picturesque design.
4. A modern cottage at Bedford Park, New York City, recently erected at a cost of $3,000. Perspective elevation and floor plans. A picturesque design. Mr. Edgar K. Bourne, architect, New York City.
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6. A Colonial cottage recently erected at New Dorp, S. I., at a cost of $3,675, complete. Perspective elevation and floor plans. Messrs. Child & De Goll, architects, New York City. An attractive design.
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References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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(6559) Orangeville writes: Having been a reader of the SCIENTIFIC AMERICAN for over twenty years, and considering it the best paper published as an educator in the home, I take the liberty to ask a question and request an answer through your columns. Our town has a population of about 3,000 and we have passed a by-law authorizing our town council to spend $45,000 in waterworks. The mayor and some others contemplate taking the water from near the public cemetery, where there are springs issuing out from the side of the hill (on the cemetery side), 36 feet and in some places 50 or 60 feet from the fence and over 20 feet lower than the fence. The advocates of these springs say that if future interments are kept back from the springs 200 or 250 feet, there will be no contamination. The cemetery is on a gravel and sand hill which rests on a pan of hard stratum of earth. The rain, after leaching through said gravel and sand, seems to be arrested in its downward tendency by this hard pan, and eventually finds its way out at the springs. What I want to know is: Is this a safe place to take water from to supply our town? We have other places where we can get it, but there is not quite as much water. A. The supply of water for town use from springs below and at a short distance from a cemetery is not worse practice than to sink wells near cesspools and privies, so prevalent all over the country, and notably so in towns and villages without waterworks supply. In some towns the well water is largely contaminated by local sewage, with perhaps an occasional epidemic of typhoid fever. We are opposed to the use of water drawn from the immediate vicinity of cemeteries, and especially if there are any indications that the subterranean water flow is from that direction. Your own people will naturally hold to this view of the subject.

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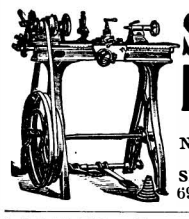

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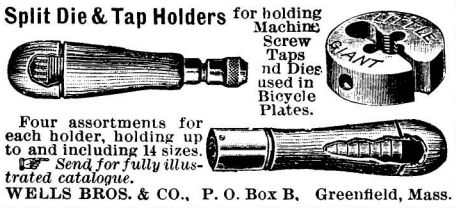

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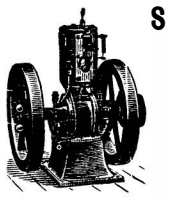

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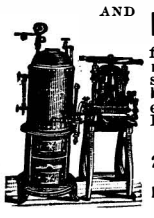

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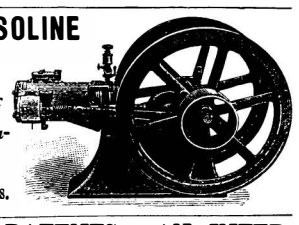

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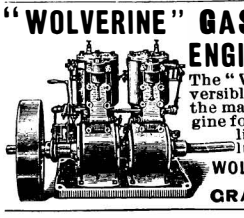

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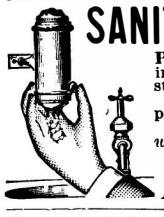

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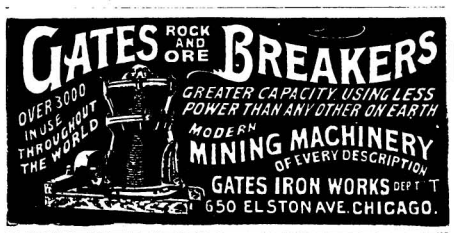
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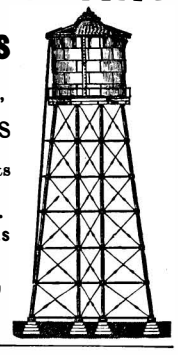

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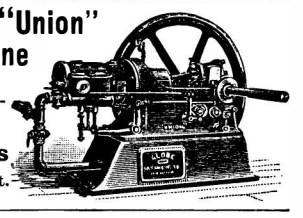

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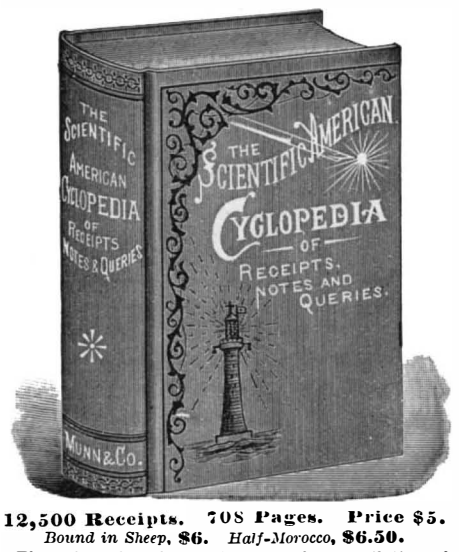

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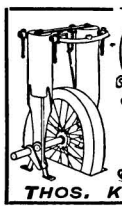

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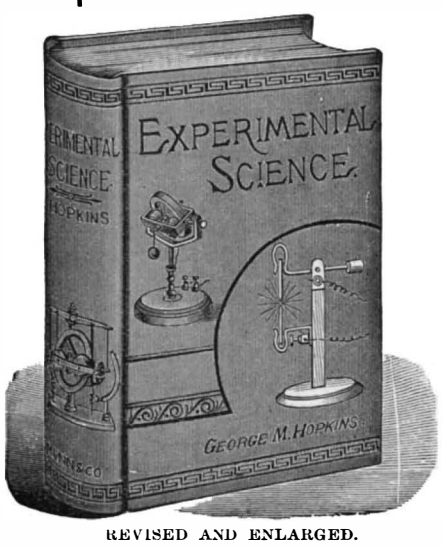

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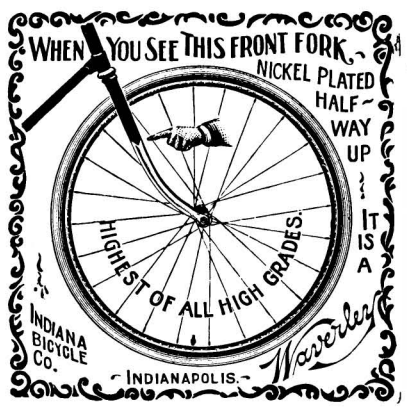

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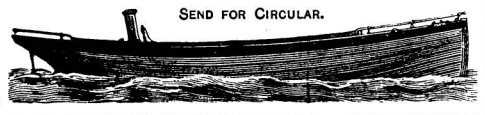

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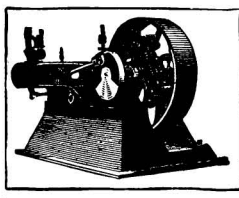

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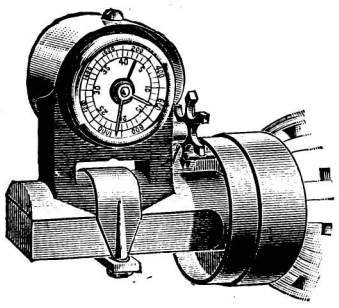

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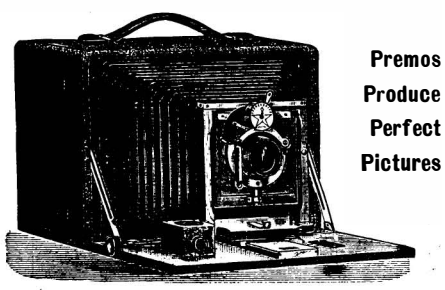

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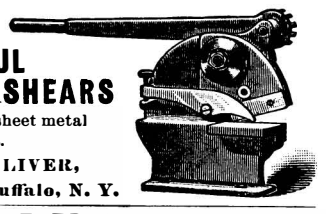

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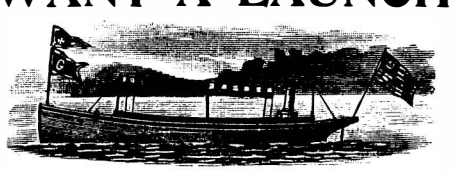

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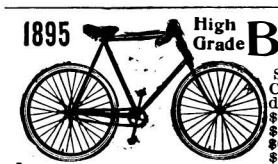

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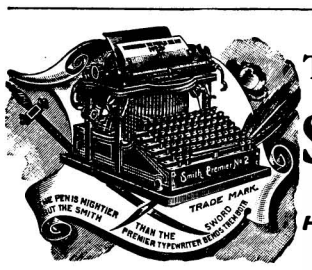

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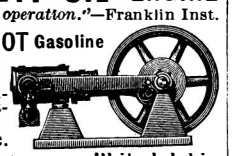

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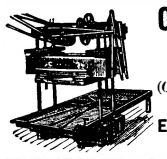

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